

Semiconductor WEEK:

January 7, 2022

An overview of results and conclusions from recent reports at VLSI

Chip Market Research Services

The ducks are lining up for the New Year

- Order activity for semiconductor equipment edged higher over the holidays, jumping past 113 degrees
- IC Inventory Levels

Semiconductor Analytics

Last Week in the Semiconductor Market:

Semiconductor sales went to their normal Christmas W/W roll-over, while Santa delivered Y/Y growth of 46% in the last week of the year. Even though they finished the year at a thin-oxygen height, Semiconductor Sales growth continued towards historic trend rates. 2021 was a hot year for sales, which have been up and to the right since March of 2021, reaching \$0.6T and on track to hit \$1T by 2030. All segments closed out the year at extremely high Y/Y growth levels.

Though they did cool in the year's last weeks. The 13-wk MA growth ranged between ~15% and ~40%, with DRAM fastest and Analog & Power the slowest. Most semiconductor forecasts for 2022 are similar to VLSI's 10%. One thing that's clear is the Auto IC shortage peaked last summer and cooled. The same is true for A&P. Memory continues to show an upward growth trend.

VLSI's IC Supply/Demand indices continued to favor DRAM, OSAT, and Auto thru the holidays. All 3 were Shortages as 4Q21 conditions closed out Tight overall. Electronics' Retail Prices rose sharply through the holidays.

VLSIresearch ... powered by **TechInsights**

Chip History Center

The dawn of automated inspection: KLA ADD/100 Series.
The tool that sparked the yield management revolution: The KLA 2020

#FactFriday: Do you know what KLA stands for today and in the past?

The Chip Insider

Happy Holidays to all and to all a good cycle

Semiconductor Stocks

- *VLSI's Semiconductor Stock sunk this week*
 - *Investors fear the impact Omicron will have on the labor market*
- *Semiconductor Stock Index sunk this week*
 - *Intel came out on top*
- *Semiconductor Equipment Stock sunk this week*
 - *Nikon was the only company to finish in positive territory*
- *EDA Stock Index plummeted*
- *Electronics Materials Stock Index slipped this week*
 - *BASF was this week's biggest winner*
- *Hottest Stocks: BASF, Nikon, Intel, Panasonic, DuPont de Nemours, and TSMC*

The Chip Insider[®]'s Graphics File



December 2021

The ducks are lining up for the New Year



- Order activity for semiconductor equipment edged higher over the holidays, jumping past 113 degrees
- Equipment suppliers are starting the year with a lot of momentum and expect 2022 to be another strong year
- VLSI's Chip Price Performance is trending higher

Forecast as of December 2021:	2021	2022
Semi Equipment (\$B):	\$ 124.7	\$ 149.9
Sequential Change	35.0%	20.2%
Capacity Utilization:	97.3%	96.5%
ICs (\$B):	\$ 487.6	\$ 540.6
Sequential Change	26.2%	10.9%
IC Units (BU):	394.2	434.0
Sequential Change	23.7%	10.1%
Electronics (\$B) :	\$ 2,536	\$ 2,710
Sequential Change	17.1%	6.8%

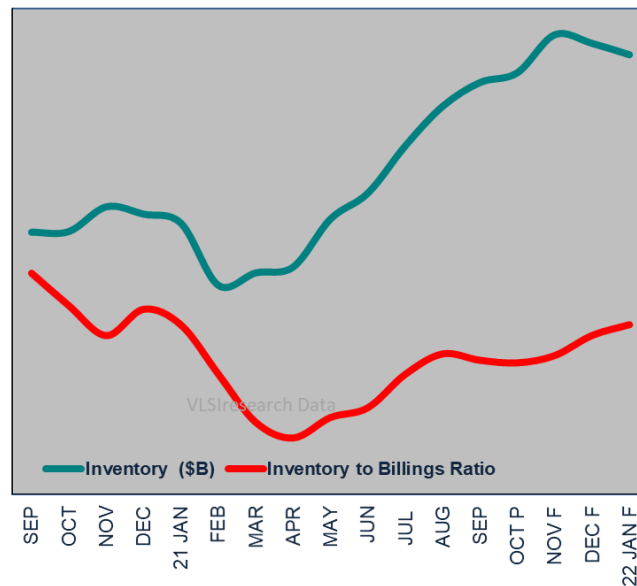
[Contact us to access more details](#)

The Chip Insider[®] Graphics

Overall inventories remain at elevated levels

IC Inventory Levels: chart gives rolling averages for semiconductor integrated circuit inventories held at OEMs and in Die Banks

Semiconductor Inventory



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weVISION Interview:

Memory Market Forecast 2022...

with Jim Handy of Objective
Analysis



What the conversation is about:

- In this video conversation, Dan talks with Jim about how 2021 unfolded, how it was different, and what he expects will happen in the markets for DRAM and NAND in 2022. Jim has been one of our most popular guests and is one of the most respected memory analysts in the world.

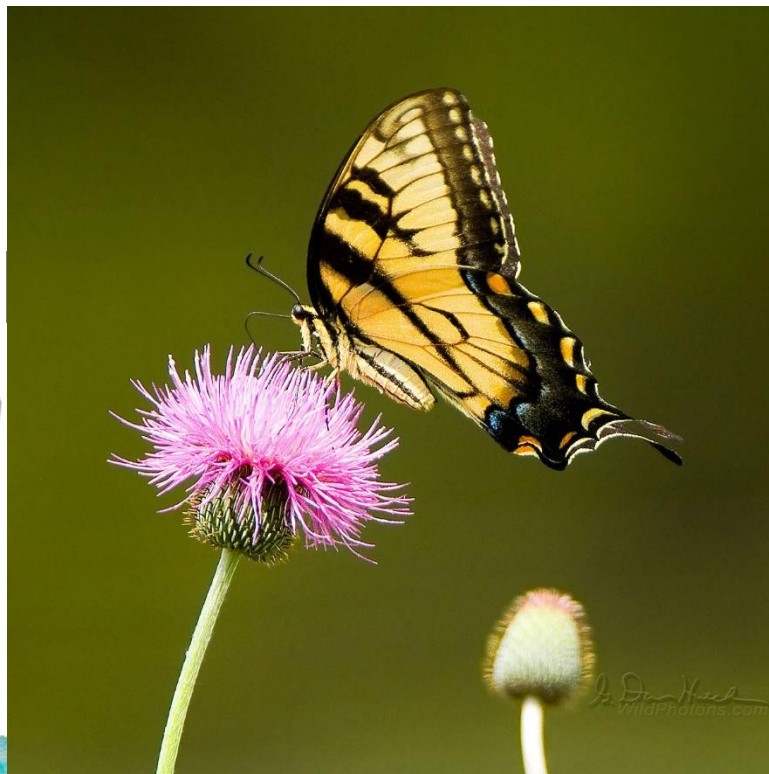
[Click here to watch online](#) or on the weVISION button in VLSI's mobile app

Semiconductor Analytics

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1: Measures Order Activity 2: Measures Pricing Power

Electronics Retail Pricing Trends:

for PC notebooks Tablets Smartphones Cell phones Digital Cameras Appliances TVs

Electronics' Retail Prices rose sharply through the holidays.

Electronics Pricing Barometer

indexed 13 week moving average

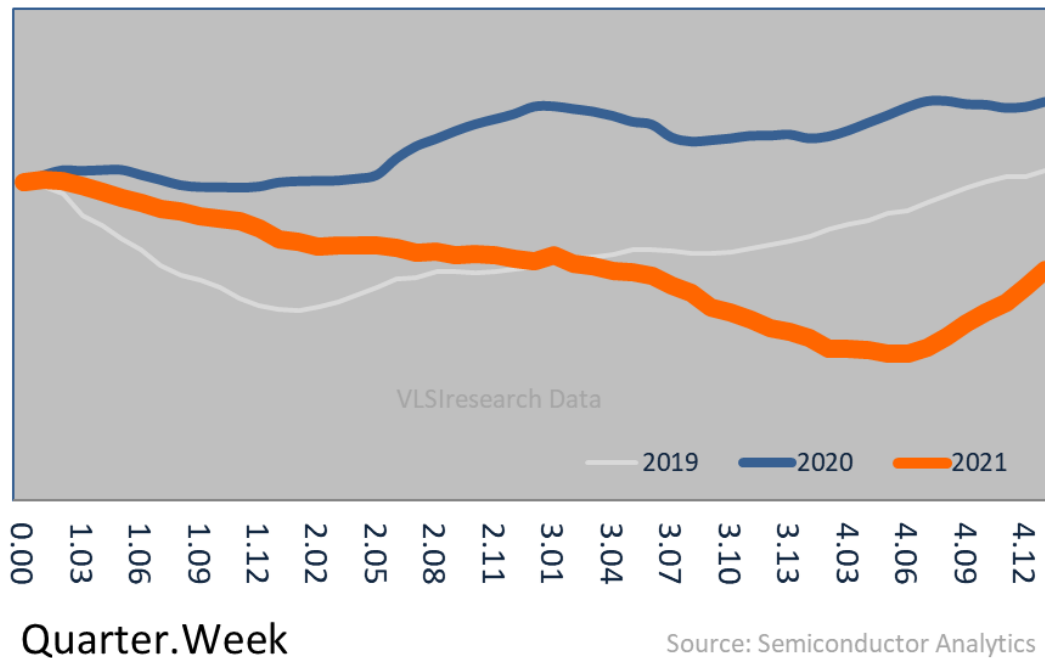


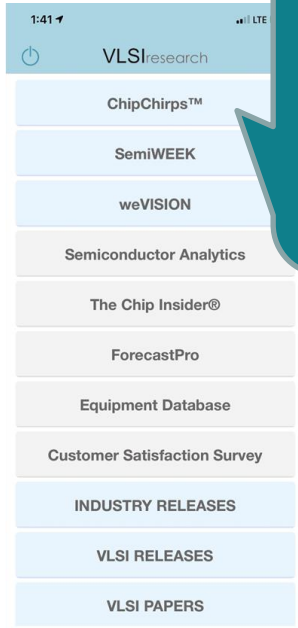
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Source: Semiconductor Analytics



on **VLSI's app**

ChipChirps™ are short notifications from VLSI's analysts to alert clients about breaking news and events



Get it on iOS or Android
 Search for 'VLSIresearch' at
 the Apple App or Google Play store

The Chip Insider®



The Chip Insider: *Happy Holidays to all and to all a good cycle*

VLSI wants to wish everyone a Happy Holiday season. We've just ended another space-trip year, where growth was beyond atmospheric heights. It was COVID crazy as well: Geopolitical tensions were high, with heated tensions in the Taiwan Strait, while America went after its tech titans and came perilously close to losing its democracy. The year kickoff with Auto IC shortages that quickly migrated to things that should never be short, like shipping containers. Auto makers pried governments to jump into chips, as TSMC became the Hope Diamond for all. Political leaders around the world held up chips and wafers, proclaiming everything ran on them. You knew that. The shocker was they hadn't figured out chips were the oil of this century 1/5th of the way into it. Last year we pointed out the "Central Banks pouring Vodka in the Punchbowl." Predictably the year ended with massive inflation. It wasn't supposed to happen for several years, but *IC's hit half-a-trillion dollars!*

With 11 months of data in for 2021, VLSI sees IC growth of +26% and equipment at +35% – both more than 2X expectations from last year. At least we got the sign right. Next year's drivers are expected to be: The continued "better normal" buildout of IT Infrastructure, the 3nm demand ramp, and the rolling out of backlogged orders from the shortage. For 2022, VLSI sees cooling growth, with ICs at +11% and equipment at +20%. Most of the people we talk to believe this will be conservative again.

Meanwhile, we'll hope Santa will bring our industry a great New Year where all the earnings beat expectations, all the guidance turns out to be low, and everyone gains market share. Statistical anomalies aside, we trust you, your family, and friends will have a well-deserved holiday and use these times to bring everyone together. We certainly wish you the happiest of holidays.

We treasure your support and confidence in us and will do everything possible to be a positive part of keeping our industry on track.



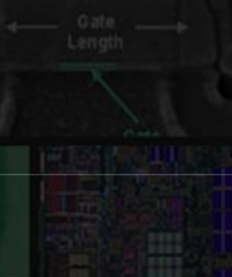
THE CHIP HISTORY CENTER

The Virtual Museum of Semiconductors

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Semiconductors are to the information age what engines are to the industrial age. Chips are the steam engine, the internal combustion engine, and the fractional horsepower engine rolled up into one. The Chip History Center is dedicated to preserving that history for future generations.

The dawn of automated inspection: [KLA ADD/100 Series](#).

The tool that sparked the yield management revolution: [The KLA 2020](#)

#FactFriday: [Do you know what KLA stands for today and in the past?](#)



THE CHIP HISTORY CENTER
The Virtual Museum of Semiconductors

**& Happy Friday
from all of us.**

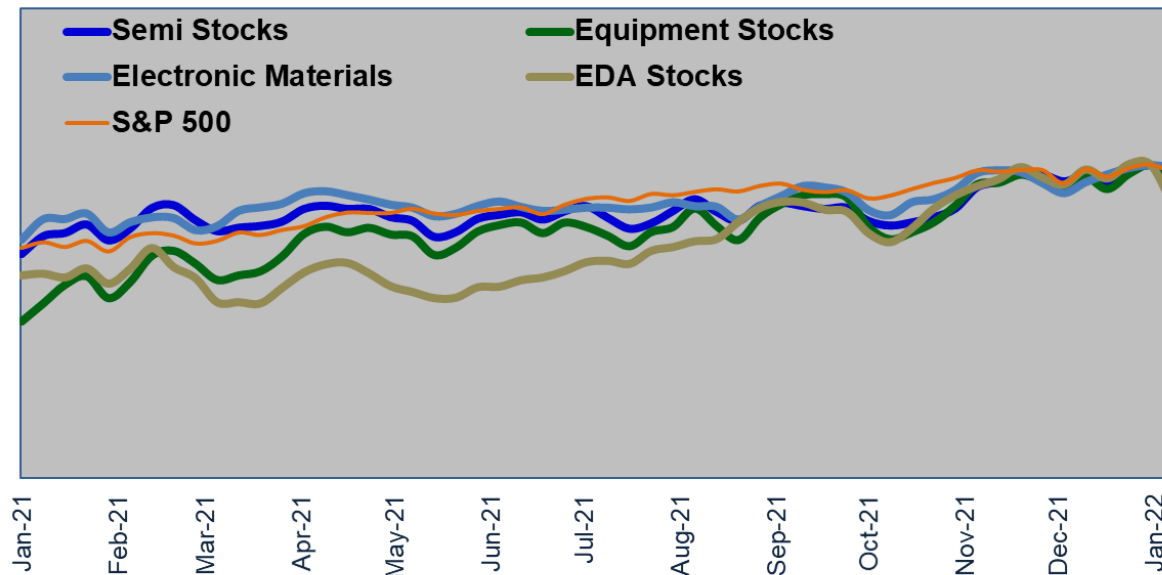
semiStockWEEK:

VLSI's Semiconductor Stock Indices sunk this week, starting the year off on rough footing as investors fear the impact Omicron will have on the labor market.



Semiconductor Industry Stock Performance Indices

(Stock Prices Indexed to 100 in last week of 2021)



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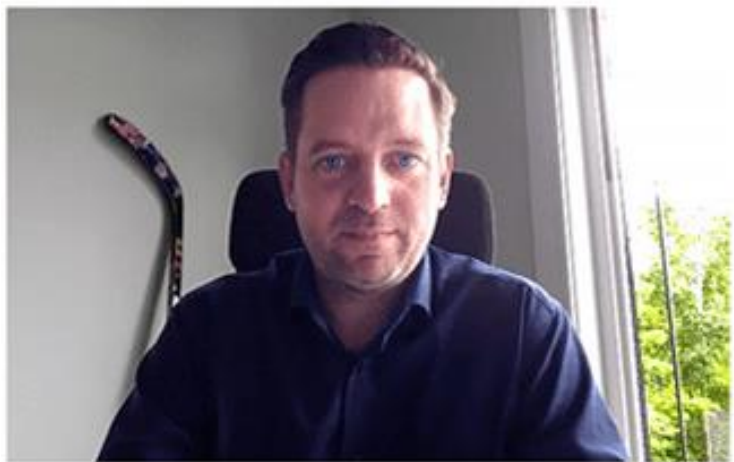
VLSI's Stock Indices:

Semiconductors -3.4%
Equipment -3.7%
Electronic Materials -0.6%
EDA -10.3%

weVISION Interview:

Announcing a new and exciting combination: VLSIresearch joins forces with TechInsights!

Effective August 16, 2021



What the conversation is about:

The business of technology is inseparable from the technology of the business. Unlike classic business, the business of technology is about constant change. It's time to bring core-technology and market analysis together, which explains why TechInsights has acquired VLSIresearch.

[Click here to watch online](#) or on the weVISION button in VLSI's mobile app

[Click here to read more about this development](#) or on the VLSI RELEASES button in VLSI's mobile app

Semiconductor Stocks:

Weekly Growth and Forward P/E Ratios by Company

Weekly Gains			1/7/2022		
Semiconductor Stocks	Price Change	Forward P/E	Semiconductor Stocks	Price Change	Forward P/E
IDM			Fab-lite to Fabless		
Intel	3.8%	14	AMD	-8.3%	40
Micron	1.4%	8	Analog Devices	-3.9%	20
ON Semiconductor	-4.9%	20	Broadcom	-7.0%	17
Samsung Electronics	0.0%	-	IBM	0.9%	13
SK hynix	-3.1%		Infineon	-1.2%	22
STMicroelectronics	2.1%	20	MagnaChip Semiconductor	-12.8%	13
Western Digital	1.0%	7	MaxLinear	-13.4%	21
Foundry & OSAT			MediaTek	-7.6%	-
Amkor	-4.4%	10	NVIDIA	-7.4%	52
ASE	-2.2%	10	Panasonic	3.6%	10
GLOBALFOUNDRIES	-7.6%	34	Qualcomm	-1.3%	15
JCET	-2.3%	19	Silicon Laboratories	-8.7%	82
SkyWater Technology	-17.5%	-	Skyworks	-0.6%	12
SMIC	-2.6%	14	Texas Instruments	-4.8%	22
TSMC	2.7%	25	Xilinx	-8.9%	48
UMC	-5.8%	11			

Above Avg

Top 4-6

Top 1-3

VLSI's Semiconductor Stock Index sunk this week despite claiming three of the top six stock spots. Intel came out on top followed by Panasonic and TSMC.

IDM 0.0%
Foundry & OSAT -5.0%
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 Semiconductor^{PC} MagnaChip
Semiconductor^{MX} MaxLinear^{MXL}
MediaTek^{2454.TW}
NVIDIA^{NVDA} Qualcomm^{QCOM}
Samsung Electronics^{005930.KS} Silicon
Laboratories^{SLAB} SkyWater
Technology^{SKYT} Skyworks^{SWKS} SMIC^{SMI}
STMicroelectronics^{STM} Texas Instruments
TXN^{TXN} TSMC^{TSM} UMC^{UMC} STMicroelectronics
Western Digital^{WDC} Xilinx^{XLNX}

Chip Equipment & Related Stocks:

Weekly Growth and Forward P/E Ratios by Company

Weekly Gains			1/7/2022		
Equipment Stocks	Price Change	Forward P/E	Equipment Stocks	Price Change	Forward P/E
Wafer Fab:			Test:		
Applied Materials	-4.2%	17	Advantest	-1.7%	-
ASM International	-8.5%	31	Teradyne	-3.2%	25
ASML	-5.0%	39	FormFactor	-7.5%	24
KLA	-3.1%	20			
Lam Research	-6.9%	18	Assembly:		
Onto Innovation	-5.9%	-	BESI	-7.9%	-
Nikon	4.0%	-	Kulicke & Soffa	-3.9%	11
TEL	-2.1%	-	ASM Pacific Technology	-0.8%	
Veeco Instruments	-2.4%	18			

Above Avg

Top 4-6

Top 1-3

VLSI's Semiconductor Equipment Stock Index sunk this week, Nikon was the only company to finish in positive territory.

WFE -2.6%

Test -1.1%

Assembly -7.2%

Applied Materials ^{AMAT} Advantest ^{ATEYY}
 ASM International ^{ASMIY}
 ASM Lithography ^{ASML} ASM Pacific ^{0522.HK}
 BE Semiconductor ^{BESIIY.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

Weekly Gains			1/7/2022		
EDA & Electronic Materials Stocks	Price Change	Forward P/E	EDA & Electronic Materials Stocks	Price Change	Forward P/E
EDA			DNP	-1.0%	-
Cadence	-10.9%	47	DuPont de Nemours	3.0%	5
Synopsys	-10.4%	37	JSR	-4.7%	-
Ansys	-9.7%	46	Shin-Etsu	-0.4%	-
Electronic Materials			SOITEC	-4.6%	-
BASF	7.4%	3	Tokyo Ohka	-3.2%	-
CMC Materials	-1.2%	23			

Above Avg

Top 4-6

Top 1-3

VLSI's EDA Stock Index plummeted this week.

VLSI's Electronic Materials Stock Index slipped this week, claiming two of the top stocks. BASF was the biggest winner this week.

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

The Prior Week's Close	VLSI's Indices of Chip Industry Stocks				Weekly Growth				Companies Up	Max Growth	Companies Down	Min Growth	Range of Growth	S&P 500	S&P 500 Growth
	Semi Stocks	Equipment Stocks	Materials Stocks	EDA Stocks	Semi Stocks	Equipment Stocks	Materials Stocks	EDA Stocks							
04-Jun-21	87.4	84.6	90.8	69.0	1.1%	2.0%	1.3%	0.2%	41	8.3%	-13	-4.6%	12.9%	88.7	0.6%
11-Jun-21	88.0	85.3	89.4	70.7	0.7%	0.8%	-1.5%	2.4%	29	11.2%	-26	-5.3%	16.5%	89.1	0.4%
18-Jun-21	86.2	82.6	88.4	71.4	-2.1%	-3.2%	-1.1%	1.0%	15	9.1%	-39	-8.4%	17.5%	87.4	-1.9%
25-Jun-21	88.3	85.3	88.7	73.0	2.4%	3.2%	0.4%	2.2%	44	13.9%	-10	-7.6%	21.5%	89.8	2.7%
02-Jul-21	89.6	84.1	89.2	75.2	1.5%	-1.3%	0.6%	3.1%	29	10.6%	-26	-7.6%	18.2%	91.3	1.7%
09-Jul-21	86.6	81.9	89.2	75.6	-3.3%	-2.7%	0.0%	0.5%	19	7.3%	-36	-10.5%	17.8%	91.7	0.4%
16-Jul-21	83.9	79.2	88.8	74.8	-3.2%	-3.2%	-0.5%	-1.0%	12	6.9%	-42	-10.8%	17.7%	90.8	-1.0%
23-Jul-21	85.3	82.9	89.2	78.1	1.7%	4.6%	0.5%	4.5%	36	9.4%	-18	-73.1%	82.5%	92.6	2.0%
30-Jul-21	88.4	84.2	90.6	79.1	3.7%	1.6%	1.5%	1.2%	39	24.0%	-15	-37.0%	61.0%	92.2	-0.4%
06-Aug-21	91.4	88.9	89.6	80.6	3.4%	5.6%	-1.1%	1.9%	46	29.1%	-8	-14.3%	43.4%	93.1	0.9%
13-Aug-21	88.2	84.4	89.4	81.1	-3.5%	-5.0%	-0.1%	0.6%	15	3.7%	-40	-14.0%	17.7%	93.7	0.7%
20-Aug-21	85.9	80.8	86.2	85.5	-2.6%	-4.3%	-3.6%	5.4%	7	8.1%	-48	-13.5%	21.6%	93.2	-0.6%
27-Aug-21	89.7	86.6	89.6	89.0	4.5%	7.1%	4.0%	4.2%	52	36.9%	-2	-4.3%	41.2%	94.6	1.5%
03-Sep-21	90.5	90.0	92.2	90.6	0.8%	4.0%	2.9%	1.7%	33	23.7%	-21	-6.0%	29.7%	95.2	0.6%
10-Sep-21	89.6	92.2	94.7	90.4	-1.0%	2.4%	2.7%	-0.2%	24	11.4%	-29	-8.1%	19.5%	93.5	-1.7%
17-Sep-21	88.9	92.6	94.3	88.6	-0.8%	0.4%	-0.4%	-2.0%	23	5.5%	-30	-6.8%	12.3%	93.0	-0.6%
24-Sep-21	89.2	91.7	93.1	88.1	0.3%	-1.0%	-1.3%	-0.5%	22	5.8%	-30	-5.2%	11.0%	93.5	0.5%
01-Oct-21	85.8	84.2	88.6	82.6	-3.8%	-8.2%	-4.8%	-6.2%	6	4.3%	-48	-14.7%	19.0%	91.4	-2.2%
08-Oct-21	84.7	81.0	87.3	80.3	-1.4%	-3.8%	-1.5%	-2.8%	15	2.9%	-39	-14.3%	17.2%	92.1	0.8%
15-Oct-21	85.5	82.8	90.6	83.9	1.0%	2.2%	3.8%	4.4%	39	8.1%	-14	-11.8%	19.9%	93.8	1.8%
22-Oct-21	86.8	85.3	91.3	88.9	1.5%	3.0%	0.8%	5.9%	40	15.7%	-14	-11.6%	27.3%	95.4	1.6%
29-Oct-21	89.0	89.6	93.7	92.2	2.6%	5.0%	2.6%	3.8%	38	24.6%	-16	-8.3%	32.9%	96.6	1.3%
05-Nov-21	94.4	95.0	98.0	94.6	6.1%	6.1%	4.6%	2.5%	45	30.5%	-8	-29.8%	60.3%	98.6	2.0%
12-Nov-21	95.9	95.5	98.7	96.4	1.5%	0.4%	0.7%	1.9%	31	8.5%	-16	-12.1%	20.6%	98.3	-0.3%
19-Nov-21	98.3	97.5	98.2	99.4	2.6%	2.1%	-0.4%	3.2%	39	12.2%	-16	-16.8%	29.0%	98.6	0.3%
26-Nov-21	97.7	96.0	95.5	96.8	-0.6%	-1.6%	-2.8%	-2.7%	16	11.8%	-39	-9.6%	21.4%	98.6	0.1%
03-Dec-21	95.9	94.5	92.9	95.0	-1.9%	-1.6%	-2.7%	-1.9%	12	6.0%	-44	-11.1%	17.1%	95.2	-3.5%
10-Dec-21	97.5	96.9	95.7	98.8	1.6%	2.6%	3.0%	4.0%	40	13.2%	-15	-7.5%	20.7%	98.9	3.8%
17-Dec-21	94.7	93.8	97.7	96.5	-2.9%	-3.2%	2.1%	-2.3%	12	25.6%	-43	-15.6%	41.2%	96.9	-1.9%
24-Dec-21	98.6	97.7	99.3	100.2	4.1%	4.2%	1.7%	3.8%	50	13.8%	-6	-2.8%	16.6%	99.2	2.3%
31-Dec-21	100.0	100.0	100.0	100.0	1.5%	2.3%	0.7%	-0.2%	44	8.1%	-11	-2.7%	10.8%	100.0	0.9%
07-Jan-22	96.6	96.3	99.4	89.7	-3.4%	-3.7%	-0.6%	-10.3%	10	7.4%	-45	-17.5%	24.9%	98.1	-1.9%

Links to Conference Call Transcripts

January 7th

[Aehr Test Systems' \(AEHR\) CEO Gayn Erickson on Q2 2022 Results - Earnings Call Transcript](#)

[Micron Technology, Inc. \(MU\) CEO Sanjay Mehrotra on Q1 2022 Results - Earnings Call Transcript](#)

December 17th and before

[Carl Zeiss Meditec AG \(CZMWF\) CEO Dr. Ludwin Monz on Q4 2021 Results - Earnings Call Transcript](#)

[Broadcom Inc. \(AVGO\) CEO Hock Tan on Q4 2021 Results - Earnings Call Transcript](#)

[NVIDIA Corporation \(NVDA\) Presents at Deutsche Bank Autotech Conference \(Transcript\)](#)

[QUALCOMM Incorporated \(QCOM\) CEO Cristiano Amon Presents at Barclays Global Technology, Media and Telecommunications Conference \(Transcript\)](#)

[Lam Research Corporation \(LRCX\) Management Presents at Barclays Global Technology, Media and Telecommunications Conference \(Transcript\)](#)

[Cisco Systems, Inc. \(CSCO\) CEO Chuck Robbins Presents at Barclays Global Technology, Media and Telecommunications Conference Call \(Transcript\)](#)

[Qorvo, Inc. \(QRVO\) CEO Bob Bruggeworth Presents at Barclays 2021 Global TMT Conference \(Transcript\)](#)

[ASML Holding N.V. \(ASML\) Management Presents at UBS Global TMT Virtual Brokers Conference \(Transcript\)](#)

[Advanced Micro Devices, Inc. \(AMD\) Management Presents at Barclays Global Technology, Media and Telecommunications Conference Call \(Transcript\)](#)

[Intel Corporation \(INTC\) Presents at UBS 2021 Global TMT Conference \(Transcript\)](#)

Links to Conference Call Transcripts

[NXP Semiconductors N.V.'s \(NXPI\) Kurt Sievers Presents at Barclays Global Technology, Media and Telecommunications Conference - \(Transcript\)](#)

[Lam Research Corporation \(LRCX\) Management Presents at UBS Global TMT Conference Call \(Transcript\)](#)

[Marvell Technology, Inc. \(MRVL\) CEO Matt Murphy Presents at UBS Global TMT Virtual Conference \(Transcript\)](#)

[NVIDIA Corporation \(NVDA\) Management Presents at UBS Global TMT Virtual Conference \(Transcript\)](#)

[Cisco Systems, Inc. \(CSCO\) Presents at Raymond James 2021 Technology Investors Conference \(Transcript\)](#)

[Cisco Systems, Inc. \(CSCO\) Management Presents at UBS Global TMT Virtual Brokers Conference \(Transcript\)](#)

[Synopsys, Inc. \(SNPS\) CEO Aart de Geus on Q4 2021 Results - Earnings Call Transcript](#)

[NVIDIA Corporation \(NVDA\) Annual Virtual Wells Fargo TMT Summit Conference \(Transcript\)](#)

[NXP Semiconductors N.V. \(NXPI\) Presents at Credit Suisse 25th Annual Technology Conference \(Transcript\)](#)

[Micron Technology's \(MU\) CEO Sanjay Mehrotra Presents at Credit Suisse 25th Annual Technology Conference \(Transcript\)](#)

[Western Digital Corporation \(WDC\) Presents at NASDAQ 45th Investor Conference \(Transcript\)](#)

[HP Inc. \(HPQ\) CEO Enrique Lores on Q4 2021 Results - Earnings Call Transcript](#)

[Dell Technologies Inc. \(DELL\) Management on Q3 2022 Results - Earnings Call Transcript](#)

[Analog Devices, Inc. \(ADI\) CEO Vincent Roche on Q4 2021 Results - Earnings Call Transcript](#)

[Agilent Technologies, Inc. \(A\) CEO Mike McMullen on Q4 2021 Results - Earnings Call Transcript](#)

[Applied Materials, Inc. \(AMAT\) CEO Gary Dickerson on Q4 Fiscal 2021 Result - Earnings Call Transcript](#)

[Kulicke and Soffa Industries, Inc. \(KLIC\) CEO Fusen Chen on Q4 2021 Results - Earnings Call Transcript](#)

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- TCI Graphics – V21.12
- Silicon Demand – V21.12
- Electronics & Macroeconomy – V21.12
- Utilization Rates – V21.12
- Diffusion Rates – V21.12
- Semiconductor Forecast – V21.12
- CapEx Distribution – V21.12
- Advanced Packaging – V21.11
- Design Completions – V21.11

Equipment Database Module:

- IC Equipment Forecast:
 - Yearly – V22.01
 - Quarterly – V22.01
- Scanner & Stepper Shipments – V22.01
- WFE by Applications – V22.01
- IC Equipment Market Shares:
 - Yearly – V20.05
 - Quarterly – V20.09

Customer Satisfaction Survey Uploads:

- 2021 CSS Databases
- 2022 Survey Documents

Critical Subsystems Uploads:

- Critical Subsystems – V21.12
- Forecast Overview – V21.12
- Graphics File: December 2021
- Semiconductor Forecast– V21.12
- Devices – V21.09
- Substrate Processing Equipment – V21.09
- Manufacturing Equipment Revenues – V21.09
- Vendor Shares – V21.04

Test Connectivity Reports:

- Test and Burn-In Socket Report : V21.04
- Probe Card Report: V21.04
- Device Interface Board Report: V20.05

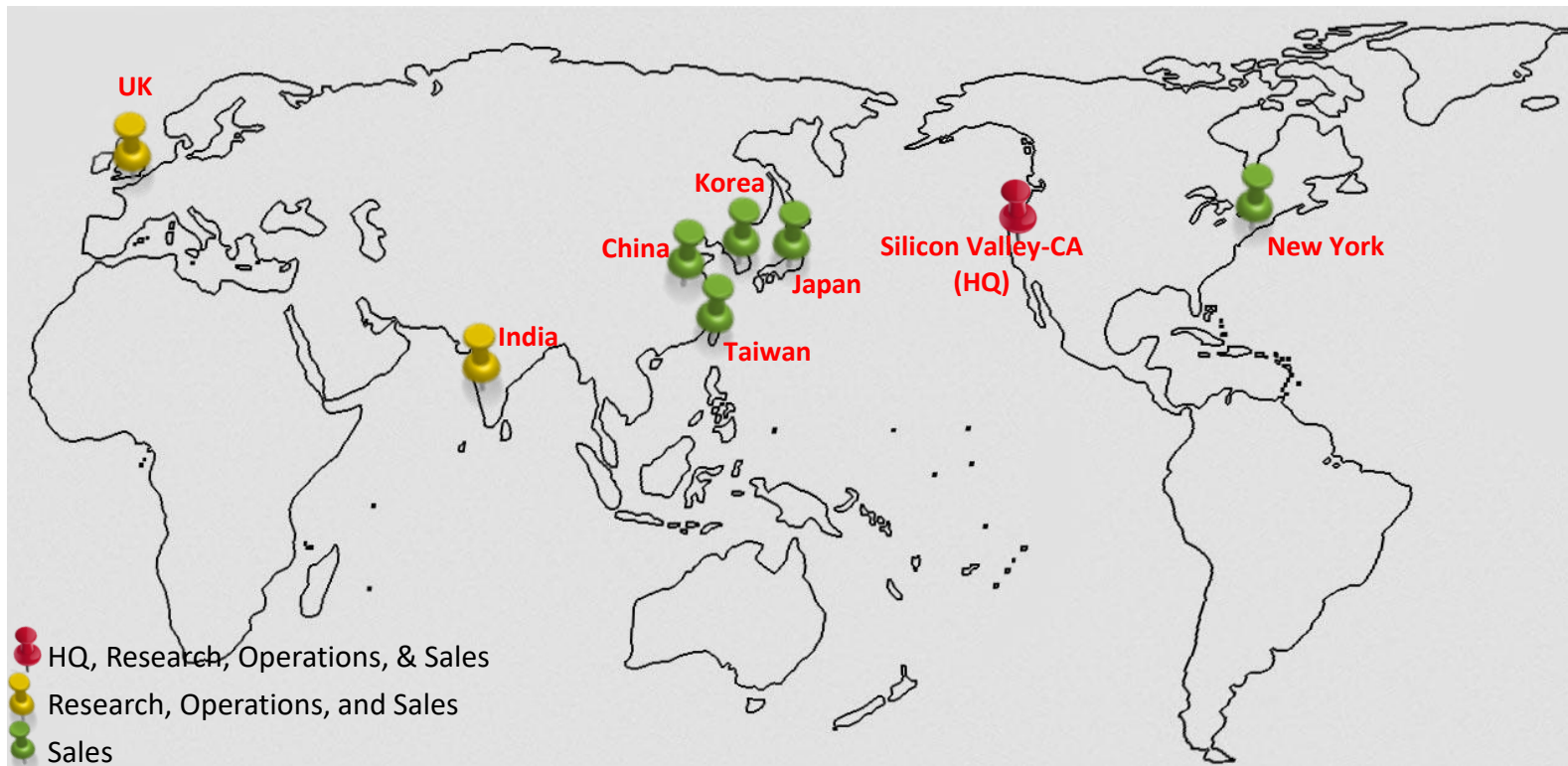
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