

March 13, 2023 11:39 AM GMT

Greater China Technology Semiconductors | Asia Pacific

TMT Webcast: The Good, the Bad and the Cloud – PC, Server, ABF, and China Cloud

MORGAN STANLEY TAIWAN LIMITED+

Daniel Yen, CFA
EQUITY ANALYST
Daniel.Yen@morganstanley.com +886 2 2730-2863

MORGAN STANLEY ASIA LIMITED+

Yang Liu
EQUITY ANALYST
Yang.Liu@morganstanley.com +852 2239-1911

MORGAN STANLEY TAIWAN LIMITED+

Howard Kao
EQUITY ANALYST
Howard.Kao@morganstanley.com +886 2 2730-2989

Greater China Technology Semiconductors

Asia Pacific IndustryView In-Line

Morgan Stanley does and seeks to do business with companies covered in Morgan Stanley Research. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of Morgan Stanley Research. Investors should consider Morgan Stanley Research as only a single factor in making their investment decision.

For analyst certification and other important disclosures, refer to the Disclosure Section, located at the end of this report.

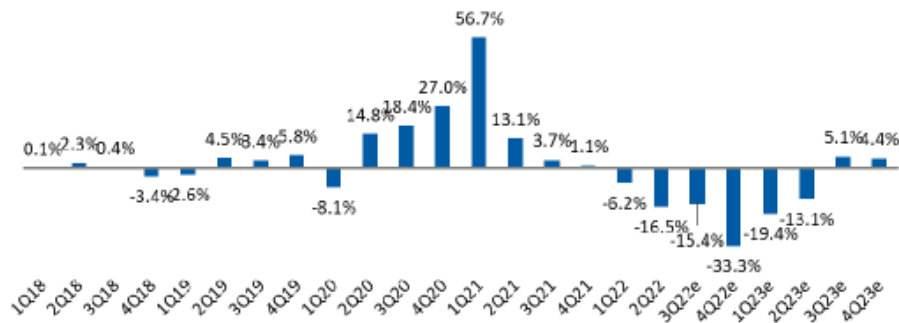
+/- Analysts employed by non-U.S. affiliates are not registered with FINRA, may not be associated persons of the member and may not be subject to FINRA restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.

Greater China Technology Semiconductor

Daniel Yen

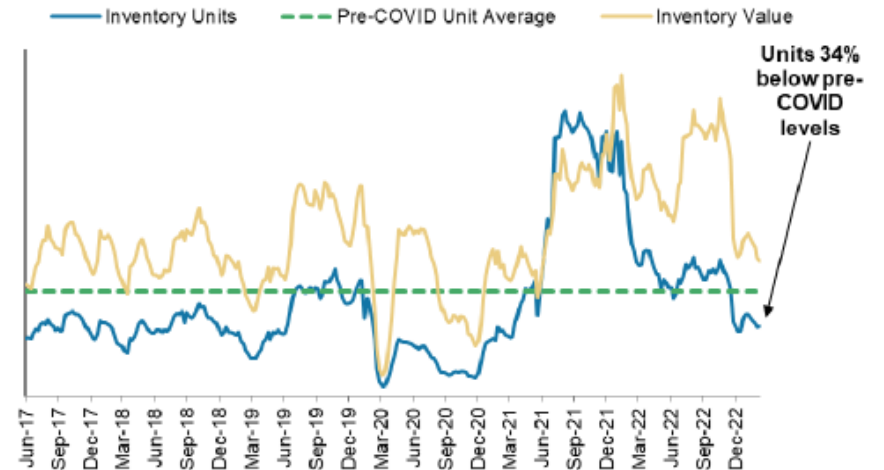
PC Semis: More Upside Ahead

4Q22 to mark the bottom for PC shipments, with 2H23 showing a recovery



US channel inventory is now back to healthier level

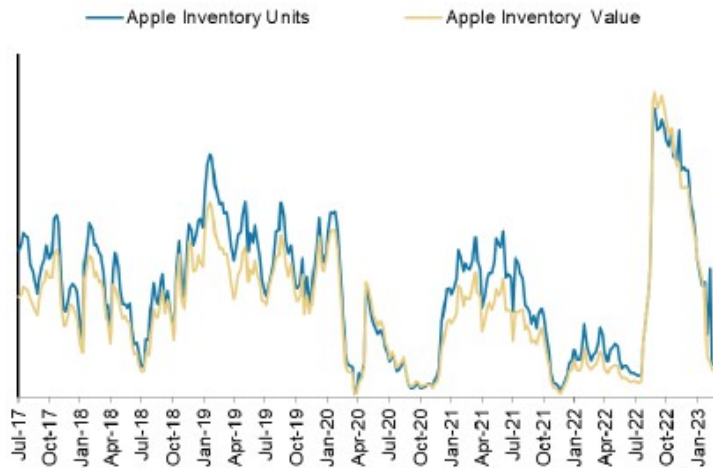
PC Channel Inventory



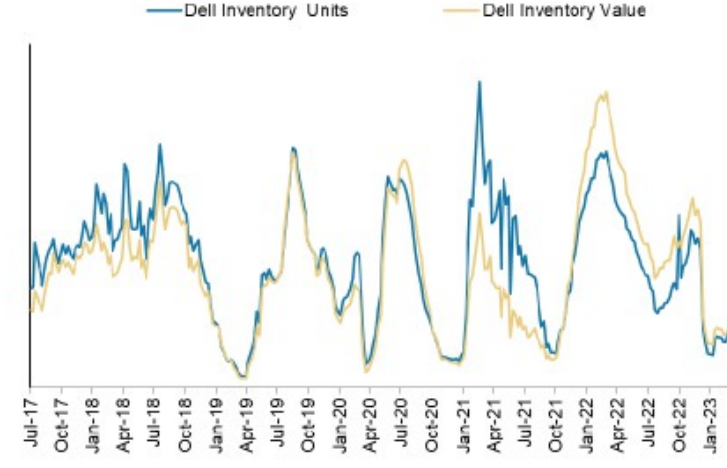
Source: IDC, Refinitiv, company data, Morgan Stanley Research (e) estimates

PC Semis: More Upside Ahead

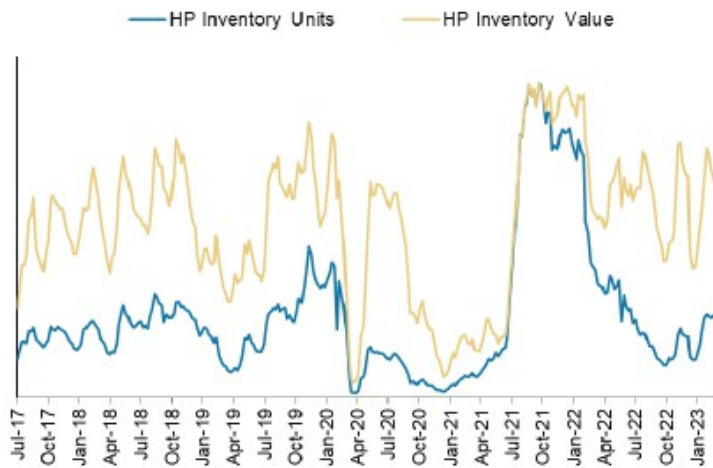
Apple Channel Inventory is 75% below pre-Covid level



Dell Channel Inventory is 60% below pre-Covid level



HP Channel Inventory is 18% below pre-Covid level



Lenovo Channel Inventory is 45% below pre-Covid level



Source: Refinitiv, company data, Morgan Stanley Research

PC Semis: More Upside Ahead

Montage EPS revision breadth vs. YoY share price performance



Realtek EPS revision breadth vs. YoY share price performance



ASMedia EPS revision breadth vs. YoY share price performance



Parade EPS revision breadth vs. YoY share price performance



Source: Refinitiv, company data, Morgan Stanley Research

Greater China Technology Hardware

Howard Kao

Greater China IT Services and Software

China Data Centers: 4Q22 Preview

Yang Liu

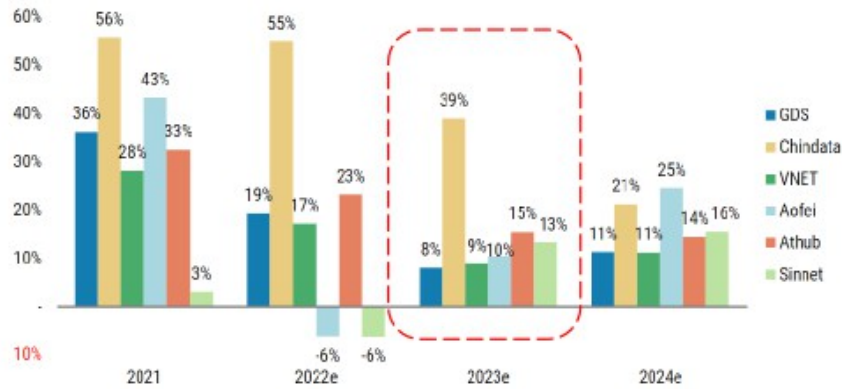
Order of preference

	Chindata CD.O	GDS GDS.O	VNET VNET.O	Shanghai Athub 603881.SS	Beijing Sinnet 300383.SZ	Aofei 300738.SZ
Rating	OW	OW	OW	EW	LW	LW
Trading Currency	USD	USD	USD	CNY	CNY	CNY
Price Target	13.0	24.0	6.0	27.0	8.0	9.3
Current Price	6.6	15.8	3.6	31.2	10.5	13.5
Upside/(Downside) (%)	88%	42%	26%	-13%	-24%	-31%
Market Cap (in USD mm)	2,550.1	3,071.1	584.9	1,512.0	2,725.8	1,385.9
Avg Daily Traded Vol (in USD mm)	15.3	38.9	10.9	33.3	33.9	24.9
Street View: Ratings						
Buy/Overweight	100%	75%	73%	75%	45%	60%
Hold/Equal-weight	0%	25%	27%	25%	36%	20%
Sell/Underweight	0%	0%	0%	0%	18%	20%
Bull Case Value	17.0	43.0	9.0	51.0	14.0	14.9
Upside (%)	146%	154%	131%	63%	33%	10%
Bear Case Value	4.0	13.0	2.0	17.0	6.0	5.3
Downside (%)	-42%	-23%	-49%	-46%	-43%	-61%
Risk/Reward Skew	3.5	6.7	2.7	1.4	0.8	0.2
Morgan Stanley Estimates						
FY23e	CNY	CNY	CNY	CNY	CNY	CNY
Sales	6,147	10,071	7,894	1,716	8,179	1,249
EBITDA	3,159	3,961	1,843	1,061	1,751	614
FY24e						
Sales	7,451	11,211	8,776	1,963	9,453	1,556
EBITDA	3,943	4,594	2,120	1,314	2,147	750
FY23 MSe vs. Consensus Mean						
Sales	3.5%	-2.0%	-4.4%	-1.2%	2.8%	-5.2%
EBITDA	3.3%	-14.4%	-11.5%	-4.4%	0.0%	11.6%
FY24 MSe vs. Consensus Mean						
Sales	1.7%	-4.6%	-5.2%	-5.6%	8.9%	-10.6%
EBITDA	3.1%	-15.3%	-14.3%	-1.8%	5.9%	0.3%
Valuation Multiples at Last Close						
FY23e						
EV/EBITDA	7.3x	13.2x	7.8x	13.9x	13.5x	21.5x
EV/Sales	3.7x	5.2x	1.8x	8.6x	2.9x	10.6x
FY24e						
EV/EBITDA	6.0x	12.3x	7.1x	11.3x	11.3x	18.0x
EV/Sales	3.2x	5.1x	1.7x	7.6x	2.6x	8.7x

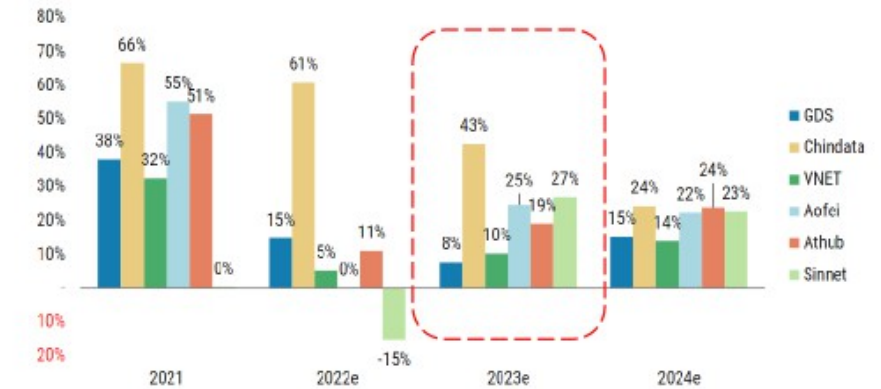
Source: Company data, Refinitiv, Morgan Stanley Research. Note: Data as of March 7, 2023.

We expect 2023 guidance to be skewed to the conservative side

IDC: Revenue YoY



IDC: EBITDA YoY



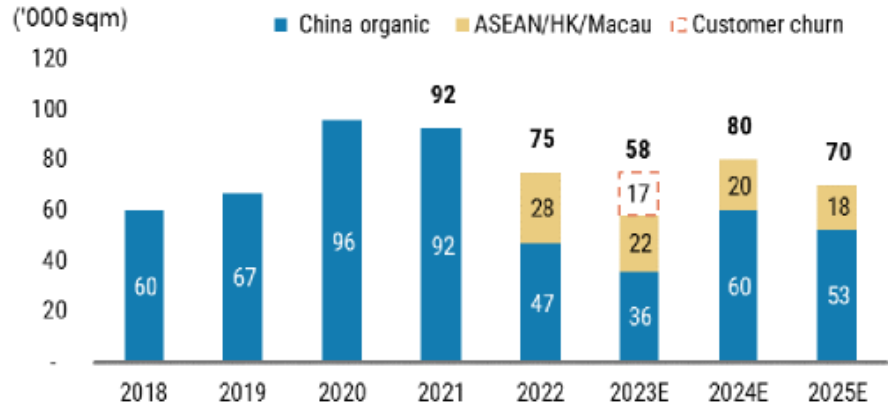
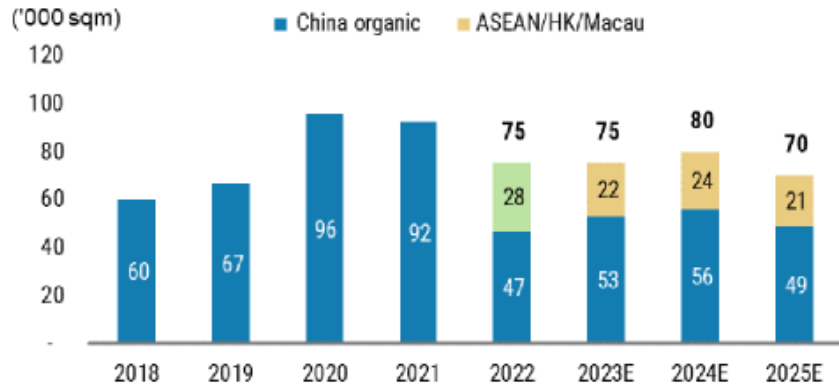
Major suppliers of leading Internet and public clouds

Client	Major supplier	Other suppliers
快手 Kuaishou	世纪互联 VNET	奥飞数据 www.aofei.com
阿里云 AliCloud		数据港 宝信软件 BAOSIGHT 奥飞数据 www.aofei.com 世纪互联 VNET
百度云 Baidu Cloud		赛尔网络 SINNET 奥飞数据 www.aofei.com
腾讯云 Tencent Cloud		世纪互联 VNET 宝信软件 BAOSIGHT 科龙 KELONG 世纪华通
ByteDance	CHINDATA GROUP	DATA

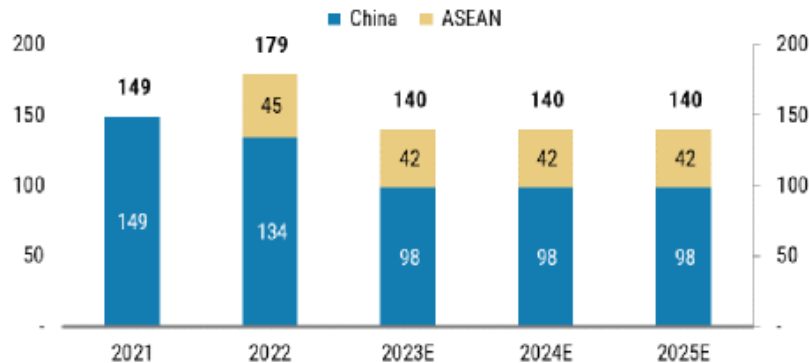
Source: Company data, Morgan Stanley Research estimates.

Bookings and capacity growth for GDS and Chindata

GDS: Gross bookings (left) and net bookings (right)



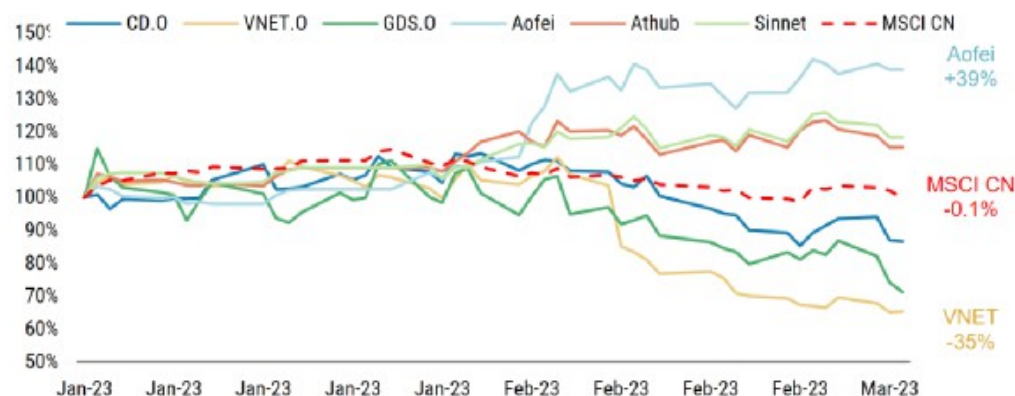
Chindata: Capacity growth



Source: Company data, Morgan Stanley Research estimates.

Same fundamentals, but divergent share price performance

YTD share price performance



Valuation comparison

Ticker	Name	Rating	PX	EV (LC mn)	EV/EBITDA			EBITDA CAGR 2022-25E
					2023E	2024E	2025E	
GDS.O	GDS	O	15.8	56,906	14.4	12.4	10.9	13%
VNET.O	VNET	O	3.6	11,897	6.5	5.6	5.2	12%
CD.O	Chindata	O	6.6	21,032	6.7	5.3	4.5	32%
603881.SS	Shanghai Athub	E	31.2	13,129	12.4	10.0	8.9	18%
300383.SZ	Beijing Sinnet	U	10.5	20,068	11.5	9.3	8.0	22%
300738.SZ	Aofei	U	13.5	12,411	20.2	16.6	14.0	23%
China - mean					10.1	8.8	7.7	20%
1686.HK	Sunevision	O	4.5	23,410	18.4	15.7	13.7	15%
NXT.AX	NEXTDC	O	10.3	5,706	28.8	26.9	21.3	17%
KEPE.SI	Keppel DC	E	2.0	4,682	20.6	20.2		
APAC - mean					22.6	21.0	17.5	16%
DLR.N	Digital Realty	E	104.4	49,617	19.2	17.8	16.8	8%
EQIX.O	Equinix	E	682.9	76,405	20.4	18.4	16.8	10%
US - mean					19.8	18.1	16.8	9%
Median					18.4	15.7	12.3	16%
Average					16.3	14.4	12.0	17%

Source: Refinitiv, Morgan Stanley Research; data as of 9 March 2023.

NAV calculations

GDS						VNET					
Rmb mn	3Q21	4Q21	1Q22	2Q22	3Q22	Rmb mn	3Q21	4Q21	1Q22	2Q22	3Q22
Total area committed (sqm)	531,760	556,822	575,009	588,054	618,369	Self-built capacity in service (cabinet)	61,453	78,540	78,964	80,831	82,660
MSR (Rmb/month)	2,361	2,351	2,296	2,265	2,237	Retail	46,639	51,626	50,550	50,917	51,246
Mature utilization rate	95.0%	95.0%	95.0%	95.0%	95.0%	Wholesale	14,814	26,914	28,414	29,914	31,414
Annual revenue	14,313	14,924	15,051	15,184	15,770	MRR					
Mature adjusted EBITDA margin	50.0%	50.0%	50.0%	50.0%	50.0%	Retail	9,296	9,301	9,236	9,186	9,287
Mature adjusted EBITDA	7,156	7,462	7,525	7,592	7,885	Wholesale	5,903	5,903	5,903	5,903	5,903
EBITDA conversion to AFFO	80.0%	80.0%	80.0%	80.0%	80.0%	Mature utilization rate					
AFFO	5,725	5,969	6,020	6,074	6,308	Retail	80%	80%	80%	80%	80%
Targeted yield	8.0%	8.0%	8.0%	8.0%	8.0%	Wholesale	95%	95%	95%	95%	95%
Implied EBITDA multiple	10.0	10.0	10.0	10.0	10.0	Annual revenue					
EV	71,563	74,618	75,253	75,921	78,848	Retail	4,162	4,610	4,482	4,490	4,569
Gross debt (including CBs)	29,760	35,761	40,777	39,712	41,693	Wholesale	997	1,811	1,912	2,013	2,114
Cash	10,104	9,968	11,321	9,159	9,092	Mature adjusted EBITDA margin					
Net debt (cash)	19,657	25,793	29,456	30,553	32,601	Retail	35.0%	35.0%	35.0%	35.0%	35.0%
Area pre-committed/under construction	97,573	98,983	106,050	104,548	130,299	Wholesale	50.0%	50.0%	50.0%	50.0%	50.0%
Capex per sqm (Rmb)	75,000	75,000	75,000	75,000	75,000	Mature adjusted EBITDA	1,955	2,519	2,525	2,578	2,656
Capex stage for the pre-committed area	50.0%	50.0%	50.0%	50.0%	50.0%	EBITDA conversion to AFFO	80.0%	80.0%	80.0%	80.0%	80.0%
Additional required capex to finished	3,659	3,712	3,977	3,921	4,886	AFFO	1,564	2,015	2,020	2,062	2,125
GDS equity value	48,247	45,113	41,820	41,448	41,360	Targeted yield	8.0%	8.0%	8.0%	8.0%	8.0%
Value per ADS (USD)	37.95	35.49	32.90	32.60	32.53	Implied EBITDA multiple	10.0	10.0	10.0	10.0	10.0
						EV	19,552	25,189	25,247	25,780	26,560
						Gross debt (including CBs)	12,185	8,230	10,494	10,711	11,373
						Cash	3,994	1,700	3,357	3,611	3,756
						Net debt (cash)	8,191	6,530	7,137	7,100	7,617
						VNET equity value	11,361	18,659	18,110	18,680	18,943
						Value per ADS (USD)	11.25	18.48	17.94	18.50	18.76

Source: Company data, Morgan Stanley Research.

Disclosure Section

The information and opinions in Morgan Stanley Research were prepared or are disseminated by Morgan Stanley Asia Limited (which accepts the responsibility for its contents) and/or Morgan Stanley Asia (Singapore) Pte. (Registration number 199206298Z) and/or Morgan Stanley Asia (Singapore) Securities Pte Ltd (Registration number 200008434H), regulated by the Monetary Authority of Singapore (which accepts legal responsibility for its contents and should be contacted with respect to any matters arising from, or in connection with, Morgan Stanley Research), and/or Morgan Stanley Taiwan Limited and/or Morgan Stanley & Co International plc, Seoul Branch, and/or Morgan Stanley Australia Limited (A.B.N. 67 003 734 576, holder of Australian financial services license No. 233742, which accepts responsibility for its contents), and/or Morgan Stanley Wealth Management Australia Pty Ltd (A.B.N. 19 009 145 555, holder of Australian financial services license No. 240813, which accepts responsibility for its contents), and/or Morgan Stanley India Company Private Limited, regulated by the Securities and Exchange Board of India ("SEBI") and holder of licenses as a Research Analyst (SEBI Registration No. INH000001105); Stock Broker (BSE Registration No. INB011054237 and NSE Registration No. INB/INF231054231), Merchant Banker (SEBI Registration No. INM000011203), and depository participant with National Securities Depository Limited (SEBI Registration No. IN-DP-NSDL-372-2014) which accepts the responsibility for its contents and should be contacted with respect to any matters arising from, or in connection with, Morgan Stanley Research, and their affiliates (collectively, "Morgan Stanley").

For important disclosures, stock price charts and equity rating histories regarding companies that are the subject of this report, please see the Morgan Stanley Research Disclosure Website at www.morganstanley.com/researchdisclosures, or contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Research Management), New York, NY, 10036 USA.

For valuation methodology and risks associated with any recommendation, rating or price target referenced in this research report, please contact the Client Support Team as follows: US/Canada +1 800 303-2495; Hong Kong +852 2848-5999; Latin America +1 718 754-5444 (U.S.); London +44 (0)20-7425-8169; Singapore +65 6834-6860; Sydney +61 (0)2-9770-1505; Tokyo +81 (0)3-6836-9000. Alternatively you may contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Research Management), New York, NY 10036 USA.

Analyst Certification

The following analysts hereby certify that their views about the companies and their securities discussed in this report are accurately expressed and that they have not received and will not receive direct or indirect compensation in exchange for expressing specific recommendations or views in this report: Howard Kao; Yang Liu; Daniel Yen, CFA.

Global Research Conflict Management Policy

Morgan Stanley Research has been published in accordance with our conflict management policy, which is available at www.morganstanley.com/institutional/research/conflictolicies. A Portuguese version of the policy can be found at www.morganstanley.com.br

Important Regulatory Disclosures on Subject Companies

As of February 28, 2023, Morgan Stanley beneficially owned 1% or more of a class of common equity securities of the following companies covered in Morgan Stanley Research: Alchip Technologies Ltd, Andes Technology Corp, ASE Technology Holding Co. Ltd., ASMedia Technology Inc, Aspeed Technology, Chindata Group Holdings Ltd, Global Unichip Corp, Hua Hong Semiconductor Ltd, Novatek, RichWave Technology Corp., Silergy Corp., Silicon Motion, StarPower Semiconductor Ltd, TSMC, UMC, Will Semiconductor Co Ltd Shanghai, WIN Semiconductors Corp, Winbond Electronics Corp, Yangjie Technology.

Within the last 12 months, Morgan Stanley managed or co-managed a public offering (or 144A offering) of securities of Chindata Group Holdings Ltd.

Within the last 12 months, Morgan Stanley has received compensation for investment banking services from Chindata Group Holdings Ltd.

In the next 3 months, Morgan Stanley expects to receive or intends to seek compensation for investment banking services from ASE Technology Holding Co. Ltd., Chindata Group Holdings Ltd, GDS Holdings Ltd, King Yuan Electronics Co Ltd, MediaTek, Nanya Technology Corp., SMIC, TSMC, UMC, Universal Scientific Ind. (Shanghai), VNET Group Inc.

Within the last 12 months, Morgan Stanley has received compensation for products and services other than investment banking services from ASE Technology Holding Co. Ltd., Chindata Group Holdings Ltd, King Yuan Electronics Co Ltd, MediaTek, Nanya Technology Corp., Novatek, Nuvoton Technology Corporation, Realtek Semiconductor, Silicon Motion, SMIC, TSMC, UMC, Universal Scientific Ind. (Shanghai), VNET Group Inc, Winbond Electronics Corp.

Within the last 12 months, Morgan Stanley has provided or is providing investment banking services to, or has an investment banking client relationship with, the following company: ASE Technology Holding Co. Ltd., Chindata Group Holdings Ltd, GDS Holdings Ltd, King Yuan Electronics Co Ltd, MediaTek, Nanya Technology Corp., SMIC, TSMC, UMC, Universal Scientific Ind. (Shanghai), VNET Group Inc.

Within the last 12 months, Morgan Stanley has either provided or is providing non-investment banking, securities-related services to and/or in the past has entered into an agreement to provide services or has a client relationship with the following company: ASE Technology Holding Co. Ltd., Chindata Group Holdings Ltd, King Yuan Electronics Co Ltd, Macronix International Co Ltd, MediaTek, Nanya Technology Corp., Novatek, Nuvoton Technology Corporation, Realtek Semiconductor, Silicon Motion, SMIC, TSMC, UMC, Universal Scientific Ind. (Shanghai), VNET Group Inc, Winbond Electronics Corp.

Morgan Stanley & Co. LLC makes a market in the securities of ASE Technology Holding Co. Ltd., Chindata Group Holdings Ltd, GDS Holdings Ltd, Silicon Motion, TSMC, UMC, VNET Group Inc.

The equity research analysts or strategists principally responsible for the preparation of Morgan Stanley Research have received compensation based upon various factors, including quality of research, investor client feedback, stock picking, competitive factors, firm revenues and overall investment banking revenues. Equity Research analysts' or strategists' compensation is not linked to investment banking or capital markets transactions performed by Morgan Stanley or the profitability or revenues of particular trading desks.

Morgan Stanley and its affiliates do business that relates to companies/instruments covered in Morgan Stanley Research, including market making, providing liquidity, fund management, commercial banking, extension of credit, investment services and investment banking. Morgan Stanley sells to and buys from customers the securities/instruments of companies covered in Morgan Stanley Research on a principal basis. Morgan Stanley may have a position in the debt of the Company or instruments discussed in this report. Morgan Stanley trades or may trade as principal in the debt securities (or in related derivatives) that are the subject of the debt research report.

Certain disclosures listed above are also for compliance with applicable regulations in non-US jurisdictions.

STOCK RATINGS

Morgan Stanley uses a relative rating system using terms such as Overweight, Equal-weight, Not-Rated or Underweight (see definitions below). Morgan Stanley does not assign ratings of Buy, Hold or Sell to the stocks we cover. Overweight, Equal-weight, Not-Rated and Underweight are not the equivalent of buy, hold and sell. Investors should carefully read the definitions of all ratings used in Morgan Stanley Research. In addition, since Morgan Stanley Research contains more complete information concerning the analyst's views, investors should carefully read Morgan Stanley Research, in its entirety, and not infer the contents from the rating alone. In any case, ratings (or research) should not be used or relied upon as investment advice. An investor's decision to buy or sell a stock should depend on individual circumstances (such as the investor's existing holdings) and other considerations.

Global Stock Ratings Distribution

(as of February 28, 2023)

The Stock Ratings described below apply to Morgan Stanley's Fundamental Equity Research and do not apply to Debt Research produced by the Firm.

For disclosure purposes only (in accordance with FINRA requirements), we include the category headings of Buy, Hold, and Sell alongside our ratings of Overweight, Equal-weight, Not-Rated and Underweight. Morgan Stanley does not assign ratings of Buy, Hold or Sell to the stocks we cover. Overweight, Equal-weight, Not-Rated and Underweight are not the equivalent of buy, hold, and sell but represent recommended relative weightings (see definitions below). To satisfy regulatory requirements, we correspond Overweight, our most positive stock rating, with a buy recommendation; we correspond Equal-weight and Not-Rated to hold and Underweight to sell recommendations, respectively.

STOCK RATING CATEGORY	COVERAGE UNIVERSE		INVESTMENT BANKING CLIENTS (IBC)			OTHER MATERIAL INVESTMENT SERVICES CLIENTS (MISC)	
	COUNT	% OF TOTAL	COUNT	% OF TOTAL IBC	% OF RATING CATEGORY	COUNT	% OF TOTAL OTHER MISC
Overweight/Buy	1353	37%	284	43%	21%	593	38%
Equal-weight/Hold	1664	45%	294	45%	18%	732	47%
Not-Rated/Hold	4	0%	0	0%	0%	0	0%
Underweight/Sell	660	18%	80	12%	12%	232	15%
TOTAL	3,681		658			1557	

Data include common stock and ADRs currently assigned ratings. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months. Due to rounding off of decimals, the percentages provided in the "% of total" column may not add up to exactly 100 percent.

Analyst Stock Ratings

Overweight (O). The stock's total return is expected to exceed the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.
 Equal-weight (E). The stock's total return is expected to be in line with the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.
 Not-Rated (NR). Currently the analyst does not have adequate conviction about the stock's total return relative to the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.
 Underweight (U). The stock's total return is expected to be below the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.
 Unless otherwise specified, the time frame for price targets included in Morgan Stanley Research is 12 to 18 months.

Analyst Industry Views

Attractive (A): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be attractive vs. the relevant broad market benchmark, as indicated below.
 In-Line (I): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be in line with the relevant broad market benchmark, as indicated below.
 Cautious (C): The analyst views the performance of his or her industry coverage universe over the next 12-18 months with caution vs. the relevant broad market benchmark, as indicated below.
 Benchmarks for each region are as follows: North America - S&P 500; Latin America - relevant MSCI country index or MSCI Latin America Index; Europe - MSCI Europe; Japan - TOPIX; Asia - relevant MSCI country index or MSCI sub-regional index or MSCI AC Asia Pacific ex Japan Index.

Important Disclosures for Morgan Stanley Smith Barney LLC & E*TRADE Securities LLC Customers

Important disclosures regarding the relationship between the companies that are the subject of Morgan Stanley Research and Morgan Stanley Smith Barney LLC or Morgan Stanley or any of their affiliates, are available on the Morgan Stanley Wealth Management disclosure website at www.morganstanley.com/online/researchdisclosures. For Morgan Stanley specific disclosures, you may refer to www.morganstanley.com/researchdisclosures. Each Morgan Stanley research report is reviewed and approved on behalf of Morgan Stanley Smith Barney LLC and E*TRADE Securities LLC. This review and approval is conducted by the same person who reviews the research report on behalf of Morgan Stanley. This could create a conflict of interest.

Other Important Disclosures

Morgan Stanley & Co. International PLC and its affiliates have a significant financial interest in the debt securities of Chindata Group Holdings Ltd, GlobalWafers Co Ltd, WIN Semiconductors Corp.
 Morgan Stanley Research policy is to update research reports as and when the Research Analyst and Research Management deem appropriate, based on developments with the issuer, the sector, or the market that may have a material impact on the research views or opinions stated therein. In addition, certain Research publications are intended to be updated on a regular periodic basis (weekly/monthly/quarterly/annual) and will ordinarily be updated with that frequency, unless the Research Analyst and Research Management determine that a different publication schedule is appropriate based on current conditions.
 Morgan Stanley is not acting as a municipal advisor and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of Section 975 of the Dodd-Frank Wall Street Reform and Consumer Protection Act.
 Morgan Stanley produces an equity research product called a "Tactical Idea." Views contained in a "Tactical Idea" on a particular stock may be contrary to the recommendations or views expressed in research on the same stock. This may be the result of differing time horizons, methodologies, market events, or other factors. For all research available on a particular stock, please contact your sales representative or go to Matrix at <http://www.morganstanley.com/matrix>.
 Morgan Stanley Research is provided to our clients through our proprietary research portal on Matrix and also distributed electronically by Morgan Stanley to clients. Certain, but not all, Morgan Stanley Research products are also made available to clients through third-party vendors or redistributed to clients through alternate electronic means as a convenience. For access to all available Morgan Stanley Research, please contact your sales representative or go to Matrix at <http://www.morganstanley.com/matrix>.
 Any access and/or use of Morgan Stanley Research is subject to Morgan Stanley's Terms of Use (<http://www.morganstanley.com/terms.html>). By accessing and/or using Morgan Stanley Research, you are indicating that you have read and agree to be bound by our Terms of Use (<http://www.morganstanley.com/terms.html>). In addition you consent to Morgan Stanley processing your personal data and using cookies in accordance with our Privacy Policy and our Global Cookies Policy (http://www.morganstanley.com/privacy_pledge.html), including for the purposes of setting your preferences and to collect readership data so that we can deliver better and more personalized service and products to you. To find out more information about how Morgan Stanley processes personal data, how we use cookies and how to reject cookies see our Privacy Policy and our Global Cookies Policy (http://www.morganstanley.com/privacy_pledge.html).
 If you do not agree to our Terms of Use and/or if you do not wish to provide your consent to Morgan Stanley processing your personal data or using cookies please do not access our research.
 Morgan Stanley Research does not provide individually tailored investment advice. Morgan Stanley Research has been prepared without regard to the circumstances and objectives of those who receive it. Morgan Stanley recommends that investors independently evaluate particular investments and strategies, and encourages investors to seek the advice of a financial adviser. The appropriateness of an investment or strategy will depend on an investor's circumstances and objectives. The securities, instruments, or strategies discussed in Morgan Stanley Research may not be suitable for all investors, and certain investors may not be eligible to purchase or participate in some or all of them. Morgan Stanley Research is not an offer to buy or sell or the solicitation of an offer to buy or sell any security/instrument or to participate in any particular trading strategy. The value of and income from your investments may vary because of changes in interest rates, foreign exchange rates, default rates, prepayment rates, securities/instruments prices, market indexes, operational or financial conditions of companies or other factors. There may be time limitations on the exercise of options or other rights in securities/instruments transactions. Past performance is not necessarily a guide to future performance. Estimates of future performance are based on assumptions that may not

be realized. If provided, and unless otherwise stated, the closing price on the cover page is that of the primary exchange for the subject company's securities/instruments.

The fixed income research analysts, strategists or economists principally responsible for the preparation of Morgan Stanley Research have received compensation based upon various factors, including quality, accuracy and value of research, firm profitability or revenues (which include fixed income trading and capital markets profitability or revenues), client feedback and competitive factors. Fixed Income Research analysts', strategists' or economists' compensation is not linked to investment banking or capital markets transactions performed by Morgan Stanley or the profitability or revenues of particular trading desks.

The "Important Regulatory Disclosures on Subject Companies" section in Morgan Stanley Research lists all companies mentioned where Morgan Stanley owns 1% or more of a class of common equity securities of the companies. For all other companies mentioned in Morgan Stanley Research, Morgan Stanley may have an investment of less than 1% in securities/instruments or derivatives of securities/instruments of companies and may trade them in ways different from those discussed in Morgan Stanley Research. Employees of Morgan Stanley not involved in the preparation of Morgan Stanley Research may have investments in securities/instruments or derivatives of securities/instruments of companies mentioned and may trade them in ways different from those discussed in Morgan Stanley Research. Derivatives may be issued by Morgan Stanley or associated persons.

With the exception of information regarding Morgan Stanley, Morgan Stanley Research is based on public information. Morgan Stanley makes every effort to use reliable, comprehensive information, but we make no representation that it is accurate or complete. We have no obligation to tell you when opinions or information in Morgan Stanley Research change apart from when we intend to discontinue equity research coverage of a subject company. Facts and views presented in Morgan Stanley Research have not been reviewed by, and may not reflect information known to, professionals in other Morgan Stanley business areas, including investment banking personnel.

Morgan Stanley Research personnel may participate in company events such as site visits and are generally prohibited from accepting payment by the company of associated expenses unless pre-approved by authorized members of Research management.

Morgan Stanley may make investment decisions that are inconsistent with the recommendations or views in this report.

To our readers based in Taiwan or trading in Taiwan securities/instruments: Information on securities/instruments that trade in Taiwan is distributed by Morgan Stanley Taiwan Limited ("MSTL"). Such information is for your reference only. The reader should independently evaluate the investment risks and is solely responsible for their investment decisions. Morgan Stanley Research may not be distributed to the public media or quoted or used by the public media without the express written consent of Morgan Stanley. Any non-customer reader within the scope of Article 7-1 of the Taiwan Stock Exchange Recommendation Regulations accessing and/or receiving Morgan Stanley Research is not permitted to provide Morgan Stanley Research to any third party (including but not limited to related parties, affiliated companies and any other third parties) or engage in any activities regarding Morgan Stanley Research which may create or give the appearance of creating a conflict of interest. Information on securities/instruments that do not trade in Taiwan is for informational purposes only and is not to be construed as a recommendation or a solicitation to trade in such securities/instruments. MSTL may not execute transactions for clients in these securities/instruments.

Certain information in Morgan Stanley Research was sourced by employees of the Shanghai Representative Office of Morgan Stanley Asia Limited for the use of Morgan Stanley Asia Limited.

Morgan Stanley is not incorporated under PRC law and the research in relation to this report is conducted outside the PRC. Morgan Stanley Research does not constitute an offer to sell or the solicitation of an offer to buy any securities in the PRC. PRC investors shall have the relevant qualifications to invest in such securities and shall be responsible for obtaining all relevant approvals, licenses, verifications and/or registrations from the relevant governmental authorities themselves. Neither this report nor any part of it is intended as, or shall constitute, provision of any consultancy or advisory service of securities investment as defined under PRC law. Such information is provided for your reference only.

Morgan Stanley Research is disseminated in Brazil by Morgan Stanley C.T.V.M. S.A. located at Av. Brigadeiro Faria Lima, 3600, 6th floor, São Paulo - SP, Brazil; and is regulated by the Comissão de Valores Mobiliários; in Mexico by Morgan Stanley México, Casa de Bolsa, S.A. de C.V which is regulated by Comisión Nacional Bancaria y de Valores. Paseo de los Tamarindos 90, Torre 1, Col. Bosques de las Lomas Floor 29, 05120 Mexico City; in Japan by Morgan Stanley MUFG Securities Co., Ltd. and, for Commodities related research reports only, Morgan Stanley Capital Group Japan Co., Ltd; in Hong Kong by Morgan Stanley Asia Limited (which accepts responsibility for its contents) and by Morgan Stanley Bank Asia Limited; in Singapore by Morgan Stanley Asia (Singapore) Pte. (Registration number 199206298Z) and/or Morgan Stanley Asia (Singapore) Securities Pte Ltd (Registration number 200008434H), regulated by the Monetary Authority of Singapore (which accepts legal responsibility for its contents and should be contacted with respect to any matters arising from, or in connection with, Morgan Stanley Research) and by Morgan Stanley Bank Asia Limited, Singapore Branch (Registration number T14FC0118J); in Australia to "wholesale clients" within the meaning of the Australian Corporations Act by Morgan Stanley Australia Limited A.B.N. 67 003 734 576, holder of Australian financial services license No. 233742, which accepts responsibility for its contents; in Australia to "wholesale clients" and "retail clients" within the meaning of the Australian Corporations Act by Morgan Stanley Wealth Management Australia Pty Ltd (A.B.N. 19 009 145 555, holder of Australian financial services license No. 240813, which accepts responsibility for its contents; in Korea by Morgan Stanley & Co International plc, Seoul Branch; in India by Morgan Stanley India Company Private Limited; in Canada by Morgan Stanley Canada Limited; in Germany and the European Economic Area where required by Morgan Stanley Europe S.E., authorised and regulated by Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin) under the reference number 149169; in the US by Morgan Stanley & Co. LLC, which accepts responsibility for its contents. Morgan Stanley & Co. International plc, authorized by the Prudential Regulatory Authority and regulated by the Financial Conduct Authority and the Prudential Regulatory Authority, disseminates in the UK research that it has prepared, and approves solely for the purposes of section 21 of the Financial Services and Markets Act 2000, research which has been prepared by any of its affiliates. RMB Morgan Stanley Proprietary Limited is a member of the JSE Limited and A2X (Pty) Ltd. RMB Morgan Stanley Proprietary Limited is a joint venture owned equally by Morgan Stanley International Holdings Inc. and RMB Investment Advisory (Proprietary) Limited, which is wholly owned by FirstRand Limited. The information in Morgan Stanley Research is being disseminated by Morgan Stanley Saudi Arabia, regulated by the Capital Market Authority in the Kingdom of Saudi Arabia, and is directed at Sophisticated investors only.

Morgan Stanley Hong Kong Securities Limited is the liquidity provider/market maker for securities of Hua Hong Semiconductor Ltd listed on the Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: <http://www.hkex.com.hk>.

The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (DIFC Branch), regulated by the Dubai Financial Services Authority (the DFSA), and is directed at Professional Clients only, as defined by the DFSA. The financial products or financial services to which this research relates will only be made available to a customer who we are satisfied meets the regulatory criteria to be a Professional Client. A distribution of the different MS Research ratings or recommendations, in percentage terms for Investments in each sector covered, is available upon request from your sales representative.

The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (QFC Branch), regulated by the Qatar Financial Centre Regulatory Authority (the QFCRA), and is directed at business customers and market counterparties only and is not intended for Retail Customers as defined by the QFCRA.

As required by the Capital Markets Board of Turkey, investment information, comments and recommendations stated here, are not within the scope of investment advisory activity. Investment advisory service is provided exclusively to persons based on their risk and income preferences by the authorized firms. Comments and recommendations stated here are general in nature. These opinions may not fit to your financial status, risk and return preferences. For this reason, to make an investment decision by relying solely to this information stated here may not bring about outcomes that fit your expectations.

The trademarks and service marks contained in Morgan Stanley Research are the property of their respective owners. Third-party data providers make no warranties or representations relating to the accuracy, completeness, or timeliness of the data they provide and shall not have liability for any damages relating to such data. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and S&P.

Morgan Stanley Research, or any portion thereof may not be reprinted, sold or redistributed without the written consent of Morgan Stanley.

Indicators and trackers referenced in Morgan Stanley Research may not be used as, or treated as, a benchmark under Regulation EU 2016/1011, or any other similar framework.

The issuers and/or fixed income products recommended or discussed in certain fixed income research reports may not be continuously followed. Accordingly, investors should regard those fixed income research reports as providing stand-alone analysis and should not expect continuing analysis or additional reports relating to such issuers and/or individual fixed income products.

Morgan Stanley may hold, from time to time, material financial and commercial interests regarding the company subject to the Research report.

INDUSTRY COVERAGE: Greater China Technology Semiconductors

COMPANY (TICKER)	RATING (AS OF)	PRICE* (03/13/2023)
Charlie Chan		

ACMResearch Inc (ACMR.O)	O (03/07/2023)	US\$11.74
Advanced Micro-Fabrication Equipment Inc (688012.SS)	U (02/22/2023)	Rmb122.00
Alchip Technologies Ltd (3661.TW)	O (05/14/2021)	NT\$998.00
Andes Technology Corp (6533.TW)	O (08/04/2022)	NT\$565.00
ASE Technology Holding Co. Ltd. (3711.TW)	E (10/12/2021)	NT\$108.50
Jiangsu Changjiang Electronics Tech (600584.SS)	U (10/12/2021)	Rmb28.49
Maxscend Microelectronics Co Ltd (300782.SZ)	U (01/11/2021)	Rmb117.20
MediaTek (2454.TW)	E (12/16/2022)	NT\$764.00
Nanya Technology Corp. (2408.TW)	E (10/04/2022)	NT\$58.50
Phison Electronics Corp (8299.TWO)	E (08/16/2022)	NT\$350.00
Silergy Corp. (6415.TW)	U (05/20/2021)	NT\$510.00
SMIC (0981.HK)	U (02/22/2023)	HK\$16.10
TSMC (2330.TW)	O (02/07/2022)	NT\$516.00
UMC (2303.TW)	O (09/14/2020)	NT\$52.50
Universal Scientific Ind. (Shanghai) (601231.SS)	O (08/04/2015)	Rmb15.53
Vanguard International Semiconductor (5347.TWO)	U (09/21/2022)	NT\$92.50
Will Semiconductor Co Ltd Shanghai (603501.SS)	E (11/01/2022)	Rmb82.78
WIN Semiconductors Corp (3105.TWO)	U (02/04/2021)	NT\$165.00

Daisy Dai, CFA

Hangzhou Silan Microelectronics Co. Ltd. (600460.SS)	E (06/10/2022)	Rmb33.13
Shanghai Anlogic Infotech Co Ltd (688107.SS)	E (11/01/2022)	Rmb62.88
Shanghai Fudan Microelectronics (1385.HK)	E (10/18/2022)	HK\$33.05
Unigroup Guoxin Microelectronics Co Ltd (002049.SZ)	U (01/10/2023)	Rmb105.86
Yangjie Technology (300373.SZ)	O (06/10/2022)	Rmb54.81

Daniel Yen, CFA

3Peak (688536.SS)	U (11/01/2022)	Rmb243.33
ASMedia Technology Inc (5269.TW)	O (05/14/2021)	NT\$1,095.00
Aspeed Technology (5274.TWO)	U (01/11/2023)	NT\$2,655.00
Bestechnic Shanghai Co Ltd (688608.SS)	O (04/23/2021)	Rmb133.68
Chipsea Technologies Shenzhen Corp (688595.SS)	O (11/15/2022)	Rmb44.42
Egis Technology Inc (6462.TWO)	U (04/23/2020)	NT\$80.20
Espressif Systems (688018.SS)	U (07/19/2021)	Rmb116.22
GigaDevice Semiconductor Beijing Inc (603986.SS)	U (10/18/2022)	Rmb101.50
Macronix International Co Ltd (2337.TW)	U (10/19/2021)	NT\$34.00
Montage Technology Co Ltd (688008.SS)	O (12/13/2022)	Rmb55.52
Novatek (3034.TW)	E (02/22/2023)	NT\$428.00
Nuvoton Technology Corporation (4919.TW)	O (07/19/2021)	NT\$145.50
Parade Technologies Ltd (4966.TWO)	O (10/04/2022)	NT\$998.00
Realtek Semiconductor (2379.TW)	O (02/22/2023)	NT\$386.00
Shenzhen Goodix Technology Co Ltd (603160.SS)	U (06/16/2020)	Rmb53.35
Sino Wealth Electronic (300327.SZ)	O (07/19/2021)	Rmb38.00
Winbond Electronics Corp (2344.TW)	O (03/02/2023)	NT\$24.45
WPG Holdings (3702.TW)	U (04/09/2021)	NT\$49.00

Dylan Liu

ASMPacific (0522.HK)	U (03/02/2023)	HK\$72.60
Chipbond Technology Corp (6147.TWO)	O (02/22/2023)	NT\$70.30
Global Unichip Corp (3443.TW)	E (12/28/2022)	NT\$1,130.00
King Yuan Electronics Co Ltd (2449.TW)	O (03/03/2023)	NT\$47.75

Ray Wu, CFA

Advanced Wireless Semiconductor Co (8086.TWO)	U (02/11/2022)	NT\$75.50
China Resources Microelectronics Limited (688396.SS)	U (07/08/2022)	Rmb58.12
GlobalWafers Co Ltd (6488.TWO)	E (02/22/2023)	NT\$497.00
Hua Hong Semiconductor Ltd (1347.HK)	O (02/04/2022)	HK\$32.15
NALURA Technology Group Co Ltd (002371.SZ)	E (11/23/2022)	Rmb262.84
Powerchip Semiconductor Manufacturing Co (6770.TW)	U (07/12/2021)	NT\$33.80
RichWave Technology Corp. (4968.TW)	E (07/12/2022)	NT\$129.00
SG Micro Corp. (300661.SZ)	E (09/27/2022)	Rmb149.70
Shanghai Awinic Technology (688798.SS)	U (09/27/2022)	Rmb113.79
Silicon Motion (SIMO.O)	E (08/12/2021)	US\$63.36
StarPower Semiconductor Ltd (603290.SS)	O (03/01/2022)	Rmb271.92
Suzhou Novosense Microelectronics Co Ltd (688052.SS)	O (09/27/2022)	Rmb283.42
UPI Semiconductor Corp. (6719.TW)	U (05/02/2022)	NT\$310.00
Wafer Works Corp (6182.TWO)	E (11/07/2022)	NT\$44.75

Stock Ratings are subject to change. Please see latest research for each company.
 * Historical prices are not split adjusted.