CMB INTERNATIONAL

招商银行全资附属机构

A Wholly Owned Subsidiary Of China Merchants Bank

China AI

U.S. may broaden AI chips export restrictions

OUTPERFORM (Maintain)

China software & IT services

Marley Ngan
(852) 3916 3719
marleyngan@cmbi.com.hk

Alex Ng
(852) 3900 0881
alexng@cmbi.com.hk

Bowen Li
(852) 3761 8957
libowen@cmbi.com.hk

Reuters reported that the U.S. may publish new regulations next month to broaden curbs on 1) AI chips, 2) chipmaking equipment and 3) products that contain targeted chips exports to China. This could cover more U.S. companies and will disallow export of servers containing advanced GPU. Under the new rules, China can still design sub-14nm (not sub-3nm) AI chips but the production has to be taken place outside of China. We see no direct impact in the near term given plenty of AI chips substitutes based on existing commercialized applications. However, this will slow advanced AI development although fundamental AI R&D will be accelerated.

- **U.S. may formalize curbs on AI chip and chipmaking tools exports to China as early as next month.** On 12 Sep, Reuters reported that The Commerce Department may publish new regulations to broaden curbs on 1) AI chips and 2) chipmaking equipment exports to China. Meanwhile, there could be 3) new license requirements on shipments to China of products that contain the targeted chips (i.e. advanced GPU).

- **Potential implications: Broadening the restrictions to more U.S. companies, disallowing export of servers containing targeted chips.** Based on our research, compared to existing "is informed" letters sent to specific companies (KLA, Lam Research, Applied Materials, Nvidia, AMD), the new rules would codify the restrictions and expand the scope of companies being covered (e.g. Intel). The "is informed" letters is a quick and interim solution laid out by the Commerce Department to halt certain products' export before the lengthy rule-writing process. On the other hand, the potential new license requirement will block servers containing the advanced GPU to export to China, even if the servers are assembled outside of China.

- **What China can do under the new rules: China can design but not produce sub-14nm (not sub-3nm) AI chip.** AI chips, whether for training or inference purposes, require sub-14nm advanced process technology. Under current restrictions, sub-14nm chipmaking equipment and sub-3nm EDA software are being banned from exporting to China. Sub-3nm is next-gen technology and is not being adopted by existing commercialized AI chips. China can still design sub-14nm AI chips although production has to be taken place outside of China (e.g. TSMC's fab in Taiwan/ SEC's fab in Korea).

- **Slowing the pace of advanced AI application development but domestic AI chip R&D likely to accelerate.** We think the potential new rules will affect advanced AI applications development (scientific research/ autonomous driving etc), negative to AI companies including SenseTime, AInnovation and Arcsoft. Meanwhile, tighter rules will accelerate China fundamental AI R&D, benefiting domestic AI fabless such as Cambricon and Jingjia Micro.

Valuation Table

Company	Ticker	Rating	Mkt Cap (US$ mn)	Price (LC)	P/E FY23E	EV/ sales FY23E	ROE FY22E	ROE FY23E	Sales CAGR FY21-24E
Hikvision	002415 CH	BUY	39,610	29.25	12.8	2.8	24.8	25.6	15%
Dahua	002236 CH	HOLD	6,253	14.36	9.4	1.2	14.9	15.5	15%
SenseTime	20 HK	BUY	9,050	2.12	n.a.	9.5	-8.8	-5.7	25%
AInnovation	2121 HK	NR	1,337	18.76	n.a.	5.1	-23.3	-15.0	63%
Cambricon	688256 CH	NR	4,057	70.50	n.a.	27.1	-18.4	-13.6	44%
Jingjia Micro	300474 CH	NR	3,743	57.46	51.1	20.2	11.0	13.8	30%
Arcsoft	688088 CH	NR	1,554	26.66	46.5	15.4	5.4	7.9	25%

Source: Company data, Bloomberg, CMBIGM estimates

Related Reports

1. "China AI – U.S. is restricting advanced GPU sales to China" – 1 Sep 2022 (link)

Figure 1: Potential changes in U.S. ban towards China AI next month, as per Reuters report

Items	Prior	New	Implications
Sub-14nm chipmaking equipment	• Only companies received "is-informed" letters	• Could apply to all U.S. companies	• Turning the letters into rules will broaden their reach to other U.S. companies with similar technology
Advanced GPU	• Only companies received "is-informed" letters	• Could apply to all U.S. companies	• Turning the letters into rules will broaden their reach to other U.S. companies with similar technology
Products that contain the targeted chips	• NO restrictions	• Export license may be required	• This may ban sever, assembled outside of China with the targeted GPU, to export to China

Source: Reuters, CMBIGM

Figure 2: U.S. bans on China AI development under Biden's administration – targeting exports to China

Items	Companies being affected (Suppliers)	Companies being affected (Customers)	Remarks
Chipmaking equipment	• Lam Research • KLA • Applied Materials	• Foundries with facilities in China (e.g. SMIC, TSMC, YMTC, Samsung Electronics, SK Hynix)	• Sub-14nm equipment
EDA (chip design software)	• Cadence • Synopsys • Mentor Graphics (Siemens)	• China AI chip design companies (e.g. SenseTime, Cambricon, Jingjia Micro)	• 3nm EDA software
GPU	• Nvidia • AMD	• China hyperscalers (e.g. Alibaba, Tencent, Baidu) • China AI companies (e.g. SenseTime)	• Nvidia A100, H100 • AMD MI250

Source: CMBIGM

Figure 3: U.S. bans on China AI development under Trumps's administration – targeting specific company

Items	Companies being affected (Suppliers)	Companies being affected (Customers)	Remarks
Entity list	• All companies supplying U.S. technology, subject to 25% U.S.-origin content rule	• All companies being put under the Entity List (e.g. Huawei, Hikvision, Dahua)	• In particular, Huawei's Hisilicon is specifically targeted such that 1) Hisiliicon cannot design chips using U.S. EDA software and 2) Foundries (e.g. TSMC fabs outside of China) cannot produce chips for Hisilicon
NS-CMIC list	• U.S. investors	• All companies being put under the NS-CMIC list (e.g. Hikvision, Dahua, SenseTime)	• U.S. investors are barred from investing in companies under NS-CMIC list

Source: CMBIGM

Figure 4: Types of AI chips

	Training	Inference in the cloud	Inference at the edge
Types of AI chips	GPU	CPU, GPU, FPGA, specialized ASIC	Many hybrid system on chips (SoC)
Suppliers	Nvidia	Intel, Nvidia, AMD, Xilinx, hyperscalers	Huawei, Ambarella, SigmaStar, Novatek, Fullhan
Advanced process needed	YES	YES	YES

Source: CMBIGM

Figure 5: U.S. banned advanced GPU exports to China and Russia (used in AI training and inference in the cloud)

	Nvidia		AMD
	A100	**H100**	**MI210**
Launch Year	2020	2022	2022
Architecture	Ampere	Hopper	CDNA2
Process	7nm	4nm	n.a.
CUDA Cores	6912	16896	6656
Performance (FP32)	19.5 TFLOPS	60 TFLOPS	22.6 TFLOPS

Source: CMBIGM

Figure 6: Existing high-end AI IPC SoC (used in AI inference at the edge)

	Huawei	Ambarella	SigmaStar	Novatek
Model	Hi3559AV100	CV22S	SSC369G	NT98530
Launch year	2018	2018	n.a.	2022
Process	12nm	10nm	n.a.	n.a.
Foundry	TSMC	Samsung	TSMC	TSMC
Tera operations per second (INT8)	4 TOPS	n.a.	4 TOPS	2 TOPS
On entity list?	YES	NO	NO	NO
Can supply to companies on entity list (e.g. Hikvision/ Dahua/ SenseTime)?	YES	YES	YES	YES

Source: CMBIGM

Figure 7: China listed AI companies

Company		Ticker	Products	Market cap (US$mn)	FY21 Sales (RMB mn)	FY21 Net profit (RMB mn)
AI chips (fabless)						
Cambricon	寒武纪	688256 CH	GPU	4,057	721	(825)
Jingjia Micro	景嘉微	300474 CH	GPU	3,743	1,093	293
Hygon Info Tech	海光信息	688041 CH	CPU	19,757	2,310	327
Loongson	龙芯中科	688047 CH	CPU	4,680	1,201	237
Anlu Technology	安路科技	688107 CH	FPGA	3,308	679	(31)
Unigroup Guoxin	紫光国微	002049 CH	FPGA	20,336	5,342	1,954
Fudan Microelectronics	复旦微电	688385 CH	FPGA	7,651	2,577	514
AI cloud service providers						
Alibaba	阿里巴巴	BABA US	AI cloud computing	236,875	717,289	150,578
Tencent	腾讯	700 HK	AI cloud computing	368,365	560,118	224,822
Baidu	百度	BIDU US	AI cloud computing	45,374	124,493	10,226
Kingsoft Cloud	金山云	KC US	AI cloud computing	550	9,061	(1,589)
AI application developers						
SenseTime	商汤	20 HK	AI applications	9,008	4,700	(17,140)
AInnovation	创新奇智	2121 HK	AI applications	1,337	861	(637)
Arcsoft	虹软科技	688088 CH	AI applications	1,554	573	141
Hikvision	海康威视	002415 CH	AI applications	39,610	81,420	16,800
Dahua	大华股份	002236 CH	AI applications	6,253	32,835	3,378
Cloudwalk	云从科技	688327 CH	AI applications	2,115	1,076	(632)
iFlytek	科大讯飞	002230 CH	AI applications	12,203	18,314	1,556

Source: CMBIGM, Bloomberg

Disclosures & Disclaimers

Analyst Certification
The research analyst who is primary responsible for the content of this research report, in whole or in part, certifies that with respect to the securities or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about the subject securities or issuer; and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific views expressed by that analyst in this report.
Besides, the analyst confirms that neither the analyst nor his/her associates (as defined in the code of conduct issued by The Hong Kong Securities and Futures Commission) (1) have dealt in or traded in the stock(s) covered in this research report within 30 calendar days prior to the date of issue of this report; (2) will deal in or trade in the stock(s) covered in this research report 3 business days after the date of issue of this report; (3) serve as an officer of any of the Hong Kong listed companies covered in this report; and (4) have any financial interests in the Hong Kong listed companies covered in this report.

CMBIGM or its affiliate(s) have investment banking relationship with the issuers covered in this report in preceding 12 months.

CMBIGM Ratings
BUY	: Stock with potential return of over 15% over next 12 months
HOLD	: Stock with potential return of +15% to -10% over next 12 months
SELL	: Stock with potential loss of over 10% over next 12 months
NOT RATED	: Stock is not rated by CMBIGM
OUTPERFORM	: Industry expected to outperform the relevant broad market benchmark over next 12 months
MARKET-PERFORM	: Industry expected to perform in-line with the relevant broad market benchmark over next 12 months
UNDERPERFORM	: Industry expected to underperform the relevant broad market benchmark over next 12 months

CMB International Global Markets Limited

Address: 45/F, Champion Tower, 3 Garden Road, Hong Kong, Tel: (852) 3900 0888 Fax: (852) 3900 0800

CMB International Global Markets Limited ("CMBIGM") is a wholly owned subsidiary of CMB International Capital Corporation Limited (a wholly owned subsidiary of China Merchants Bank)

Important Disclosures
There are risks involved in transacting in any securities. The information contained in this report may not be suitable for the purposes of all investors. CMBIGM does not provide individually tailored investment advice. This report has been prepared without regard to the individual investment objectives, financial position or special requirements. Past performance has no indication of future performance, and actual events may differ materially from that which is contained in the report. The value of, and returns from, any investments are uncertain and are not guaranteed and may fluctuate as a result of their dependence on the performance of underlying assets or other variable market factors. CMBIGM recommends that investors should independently evaluate particular investments and strategies, and encourages investors to consult with a professional financial advisor in order to make their own investment decisions.
This report or any information contained herein, have been prepared by the CMBIGM, solely for the purpose of supplying information to the clients of CMBIGM or its affiliate(s) to whom it is distributed. This report is not and should not be construed as an offer or solicitation to buy or sell any security or any interest in securities or enter into any transaction. Neither CMBIGM nor any of its affiliates, shareholders, agents, consultants, directors, officers or employees shall be liable for any loss, damage or expense whatsoever, whether direct or consequential, incurred in relying on the information contained in this report. Anyone making use of the information contained in this report does so entirely at their own risk.
The information and contents contained in this report are based on the analyses and interpretations of information believed to be publicly available and reliable. CMBIGM has exerted every effort in its capacity to ensure, but not to guarantee, their accuracy, completeness, timeliness or correctness. CMBIGM provides the information, advices and forecasts on an "AS IS" basis. The information and contents are subject to change without notice. CMBIGM may issue other publications having information and/ or conclusions different from this report. These publications reflect different assumption, point-of-view and analytical methods when compiling. CMBIGM may make investment decisions or take proprietary positions that are inconsistent with the recommendations or views in this report.
CMBIGM may have a position, make markets or act as principal or engage in transactions in securities of companies referred to in this report for itself and/or on behalf of its clients from time to time. Investors should assume that CMBIGM does or seeks to have investment banking or other business relationships with the companies in this report. As a result, recipients should be aware that CMBIGM may have a conflict of interest that could affect the objectivity of this report and CMBIGM will not assume any responsibility in respect thereof. This report is for the use of intended recipients only and this publication, may not be reproduced, reprinted, sold, redistributed or published in whole or in part for any purpose without prior written consent of CMBIGM.
Additional information on recommended securities is available upon request.

For recipients of this document in the United Kingdom
This report has been provided only to persons (I)falling within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (as amended from time to time)("The Order") or (II) are persons falling within Article 49(2) (a) to (d) ("High Net Worth Companies, Unincorporated Associations, etc.,) of the Order, and may not be provided to any other person without the prior written consent of CMBIGM.

For recipients of this document in the United States
CMBIGM is not a registered broker-dealer in the United States. As a result, CMBIGM is not subject to U.S. rules regarding the preparation of research reports and the independence of research analysts. The research analyst who is primary responsible for the content of this research report is not registered or qualified as a research analyst with the Financial Industry Regulatory Authority ("FINRA"). The analyst is not subject to applicable restrictions under FINRA Rules intended to ensure that the analyst is not affected by potential conflicts of interest that could bear upon the reliability of the research report. This report is intended for distribution in the United States solely to "major US institutional investors", as defined in Rule 15a-6 under the US, Securities Exchange Act of 1934, as amended, and may not be furnished to any other person in the United States. Each major US institutional investor that receives a copy of this report by its acceptance hereof represents and agrees that it shall not distribute or provide this report to any other person. Any U.S. recipient of this report wishing to effect any transaction to buy or sell securities based on the information provided in this report should do so only through a U.S.-registered broker-dealer.

For recipients of this document in Singapore
This report is distributed in Singapore by CMBI (Singapore) Pte. Limited (CMBISG) (Company Regn. No. 201731928D), an Exempt Financial Adviser as defined in the Financial Advisers Act (Cap. 110) of Singapore and regulated by the Monetary Authority of Singapore. CMBISG may distribute reports produced by its respective foreign entities, affiliates or other foreign research houses pursuant to an arrangement under Regulation 32C of the Financial Advisers Regulations. Where the report is distributed in Singapore to a person who is not an Accredited Investor, Expert Investor or an Institutional Investor, as defined in the Securities and Futures Act (Cap. 289) of Singapore, CMBISG accepts legal responsibility for the contents of the report to such persons only to the extent required by law. Singapore recipients should contact CMBISG at +65 6350 4400 for matters arising from, or in connection with the report.