Semiconductor sector

Our first take on US export restrictions

Key message

On October 17, the US government (The U.S. Department of Commerce's Bureau of Industry and Security, BIS) unveiled modifications to its export controls, specifically aimed at advanced computing and semiconductor products destined for China. Given a limited sales weighting of non-exportable products for Taiwanese upstream providers, we expect only a modest sales and earnings impact from the new US export regulations. In addition, we believe the latest measures is more or less within street expectations, and do not regard this event as a major negative surprise.

Event

On October 17, the US government (The U.S. Department of Commerce's Bureau of Industry and Security, BIS) unveiled modifications to its export controls, specifically aimed at advanced computing and semiconductor products destined for China. We note that the restrictions do not apply to products not designed or marketed for data centers with a total processing performance (TPP) below 4,800. Furthermore, the latest measures also add more than 40 destination countries for which companies will need to apply for advanced computing chip export licenses, designed to prevent chips from detouring to other countries and eventually entering China.

Impact

Nvidia and Habana Labs to bear the brunt; Alchip Technologies to face repercussions. We note that products such as Nvidia's (US) A100/H100, A800/H800, L40S, RTX 4090, and Habana Labs' (an Israeli AI chip supplier under Intel (US)) Gaudi 2 and Gaudi 3 will fall under the aforementioned control conditions, presaging a sales downside for both Nvidia and Intel. Additionally, as Alchip Technologies (3661 TT, NT$2,440, OP) provides design service and turnkey solutions to Habana Labs' Gaudi 2 and Gaudi 3 products, we think that the company will not be immune from the new US export controls. We estimate both projects, combined, to constitute 15-20% of Alchip Technologies' 2024F revenue. Given that over 50% of the demand for Gaudi 2 originates from China, the company's 2024F revenue could see a downside of approximately 10%.

ASML's DUV 1980i models may also be ineligible to ship to China. In terms of equipment, the latest rules largely mirror their predecessors. A notable change is the elimination of the de minimis rule pertaining to photolithography equipment. Consequently, shipments of ASML's (NL) immersion DUV are expected to come under US oversight. Furthermore, the revised US directives may restrict the export of ASML's DUV 1980i models for advanced nodes (14, 16nm) to China. Presently, the company has stated that it is in negotiations with the US government, and does not foresee a material impact on their 2023F outlook.

Limited impact on Taiwanese upstream suppliers. We expect limited 2023-24F sales impact on TSMC (2330 TT, NT$540, OP), according to our estimate of wafer consumptions for A800, H800 and L40S chips. Furthermore, we believe the latest export controls will also lead to very limited impact on the interposer business of United Microelectronics Corp (UMC) (2303 TT, NT$48.45, OP). On the other hand, although most testing processes for AI accelerators, including final testing (FT), system level testing (SLT) and burn-in testing, are conducted by King Yuan Electronics (KYEC) (2449 TT, NT$81.5, NR), we believe the latest measures will only have a minimal impact on KYEC 2023-24F sales given demand still outstrips supply.

Stocks for Action

Given a limited sales weighting of non-exportable products for Taiwanese upstream providers, we expect only a modest sales and earnings impact from the new US export regulations. In addition, we believe the latest measures is more or less within street expectations, and do not regard this event as a major negative surprise.

Risks

Weak macro environment; escalating Sino-US tension; US technology export restrictions.

US export controls updates - aiming to tighten AI/HPC controls

On October 17, the US government (The U.S. Department of Commerce's Bureau of Industry and Security, BIS) unveiled modifications to its export controls, specifically aimed at advanced computing and semiconductor products destined for China. Concurrently, three documents related to these export controls for China were updated:

- The Entity List now includes multiple China-based entities, with the prominent addition of two major GPU companies, Biren (CN) and Moore Thread (CN).
- Modifications were made to the Export Controls on Semiconductor Manufacturing Items.
- A new set of controls was introduced, emphasizing certain advanced computing products and the end use of supercomputers and semiconductors.

In light of the scant details shared by the impacted companies, and to maintain timely communication, we've segmented our analysis of these regulatory changes into several separate sections below. Further updates or necessary corrections will be communicated as they arise.

Focusing on processing performance restrictions

Yesterday, the US government (The US Department of Commerce's Bureau of Industry and Security, BIS) revised its export control ban concerning China. In the revised regulation, 3A090.a, it is stipulated that an IC containing one or more digital processing units will require export licenses to any destination specified in country groups D:1, D:4, or D:5 that are not also in country groups A:5 or A:6 if it meets any of the following two criteria:

- Total processing performance (TPP) >= 4,800
- TPP >= 1,600 and performance density (PD) >= 5.92

Regarding the new measures outlined in 3A090.b, BIS will provide licensing exemptions for chip export destinations in country group D:1, D:4, or D:5, but use of license exemptions will require pre-notification of the export or reexport to Macau or a destination specified in country group D:5. The two criteria of 3A090.b are as followed:

- 2,400 <= TPP < 4,800 and 1.6 <= PD < 5.92
- TPP >= 1,600 and 3.2 <= PD < 5.92

TPP is defined as the peak number of TOPS (tera "trillion" operations per second), multiplied by the bit length of the operation. PD is defined as the ratio of TPP to applicable die area (measured in millimeters squared).

The items under these controls include graphical processing units (GPUs), tensor processing units (TPUs), neural processors, in-memory processors, vision processors, text processors, co-processors/accelerators, adaptive processors, field-programmable logic devices (FPLDs), and application-specific integrated circuits (ASICs). However, the restrictions do not apply to products not designed for or sold to data centers with a TPP below 4,800.

In these revised export controls, the US government has also eliminated the evaluation standard based on interconnect bandwidth. Instead, the primary criteria are the computational capacities of TPP and PD.

Nvidia's A800/H800, L40S, RTX 4090, as well as Habana Labs' Gaudi 2 & Gaudi 3 will likely be banned for export to China

We note that products such as Nvidia's A100/H100, A800/H800, L40S, RTX 4090, and Habana Labs' (an Israeli AI chip supplier under Intel) Gaudi 2 and Gaudi 3 will fall under the aforementioned control conditions. This development is likely to affect the future revenues of Nvidia and Intel, in China. For Nvidia's data center segment, Chinese demand constitutes roughly 20-25%, consistent with historical trends. The firm suggests that the recent regulations will pose minimal immediate consequences, due to their data center products being in high demand and short supply. Nonetheless, we anticipate lasting repercussions for their data center sales in China.

Figure 1: Based on the US export controls updates, Nvidia's A100/H100, A800/H800, L40S/L4 & RTX 4090 could likely be banned for export to China

Criteria of 3A090.a and 3A090.b:

3A090.a
A1. Total processing performance (TPP) >= 4,800
A2. TPP >= 1,600 and performance density (PD) >= 5.92

3A090.b
B1. 2,400 <= TPP < 4,800 and 1.6 <= PD < 5.92
B2. TPP >= 1,600 and 3.2 <= PD < 5.92

*TPP is defined as the peak number of TOPS (tera "trillion" operations per second) multiplied by the bit length of the operation, and PD is the ratio of TPP to applicable die area (measured in millimeters squared).

**The restrictions do not apply to products not designed or sold for data centers with a TPP below 4,800.

Vendor	Product	INT8 Tensor TOPS	TPP	Die size (mm^2)	PD	Whether the conditions are met
Nvidia	A100	624	4,992	826	6.0	A1
Nvidia	A800	624	4,992	826	6.0	A1
Nvidia	H100	3,026	24,208	814	29.7	A1
Nvidia	H800	3,026	24,208	814	29.7	A1
Nvidia	L40S	733	5,864	608	9.6	A1
Nvidia	L40	362	2,896	608	4.8	B1
Nvidia	L4	485	3,880	294	13.2	A2
Nvidia	RTX 4090	661	5,285	608	8.7	A1
Nvidia	RTX 4080	390	3,119	379	8.2	A2
AMD	MI250	362	2,897	724	4.0	B1
AMD	MI300	>=362.1	>=2,897	1,017	2.8	Likely B1

Source: Company data, TechPowerUp, BIS, KGI Research estimates

Restrictions on Habana Labs' Gaudi 2 & Gaudi 3 could result in downside for Alchip Technologies' 2024F business, but its long-term outlook remains promising

Alchip Technologies (3661 TT, NT$2,440, OP) was commissioned to provide design services and oversee production matters related to the Gaudi 2 and Gaudi 3 AI chips. We estimate both projects, combined, to constitute 15-20% of Alchip Technologies' 2024 revenue. Given that we forecast over 50% of the demand for Gaudi 2 originates from China, the company's 2024F revenue could see a downside of approximately 10%.

Additionally, the US formally added Biren to the Entity List yesterday. We project this to have little repercussions for Alchip Technologies' business in China. Yet, with the reduction of China's contribution to revenue from 74% in 2021 to 20% in 1H23, and considering that this client is forecast to represent only 0-5% of total revenue, we assess the impact to be both limited and manageable.

While we foresee a short-term drop in Alchip Technologies' stock price, due to the US export controls updates, the firm's overall outlook remains promising. The company's focus in 2024F is expected to center on providing ASIC design services for a US hyperscaler, including AI ASICs, chips for mobile and smart devices, and an offering of consumer electronic product chips to a Japanese customer. The inclusion of automotive projects and robust demand for ASIC projects suggest that any revenue gaps may be compensated for by new initiatives.

ASML's DUV 1980i models may also be ineligible to ship to China

In terms of equipment, the latest rules largely mirror their predecessors. A notable change is the elimination of the de minimis rule pertaining to photolithography equipment. Consequently, shipments of ASML's immersion DUV are expected to come under US oversight. Furthermore, the revised US directives may restrict the export of ASML's DUV 1980i models for advanced nodes (14, 16nm) to China. Presently, the company has stated that it is in negotiation with the US government, and does not foresee a material impact on their 2023F outlook.

Limited impact on Taiwanese upstream suppliers, like TSMC & UMC

We expect limited 2023-24F sales impact on TSMC, according to our forecast of wafer consumptions for A800, H800 and L40S chips. For UMC, the latest export controls should also exert minimal influence on its interposer business. On the other hand, although KYEC conducts most testing processes for AI accelerators, including final testing (FT), system level testing (SLT) and burn-in testing, we still expect very minimal impact on its 2023-24F sales.

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