

## TECHNOLOGY

## U.S. implements HBM export controls

On 2 December, the United States Department of Commerce implemented additional export controls to restrict the export of advanced semiconductor technologies and memory components – specifically high-bandwidth memory (HBM) chips, to China.<sup>1 2</sup> The latest restrictions include adding 136 Chinese companies associated with military technologies to a trade blacklist, prohibiting the export of specific semiconductor equipment, and enforcing compliance with U.S. production and software standards even for non-U.S. manufactured goods.<sup>3 4</sup>

The U.S. has previously identified HBM as critical for artificial intelligence applications, as they support AI accelerators necessary for training machine learning (ML) models.<sup>5</sup> In its press statement, Commerce Secretary Gina Raimondo described this latest action as "the culmination of the Biden-Harris Administration's targeted approach, in concert with our allies and partners, to impair the PRC's ability to indigenize the production of advanced technologies that pose a risk to our national security."<sup>6</sup>

Industry observers predict that while the immediate impact on South Korean companies, such as SK Hynix, may be limited due to their existing supply agreements with the U.S., other companies like Samsung could face challenges from these new restrictions.<sup>7 8 9</sup>

China has expressed strong opposition to the recent export controls imposed by the U.S. on its semiconductor industry.<sup>10 11 12</sup> China's Ministry of Commerce condemned the U.S. actions as economic coercion and non-market behaviour, asserting that they undermine international trade and disrupt global supply chains.<sup>13 14</sup> In retaliation, on 3 December, China announced new export controls on dual-use items. A statement from the Chinese Ministry of Commerce (MOFCOM) declared that "exports of gallium, germanium, antimony and super-hard materials to the U.S. will be prohibited in principle". Meanwhile, graphite exports to the U.S. will face a "more stringent review" of end users and intended use.<sup>15 16 17</sup>

This builds on China's earlier responses to the tightening of U.S. export controls, such as the 2023 measures prohibiting the export of critical materials like gallium and germanium, which are essential for semiconductor production.<sup>18</sup> In its official statement, MOFCOM emphasised that these measures are intended to safeguard national security as a direct response to the U.S.'s actions.<sup>19 20</sup> Moreover, spokespersons for the Chinese government indicated that they will ensure strict compliance with these new regulations, holding violators accountable.<sup>21 22</sup>

Industry responses reported by Xinhua, China's official state news agency, indicate that some Chinese companies, such as Empyrean Technology and the NAURA Technology Group, anticipate minimal impact from the U.S. restrictions due to their domestic market focus and prior preparations for such external challenges.<sup>23 24</sup> Similarly, Xinhua quoted individual Chinese analysts who suggested that while the immediate effects of the U.S. controls might be limited, they could ultimately drive Chinese firms to improve self-sufficiency in semiconductor technologies.<sup>25</sup> Across other reporting, China's trade groups, including the Semiconductor Industry Association, warned against the purchasing of U.S. chips, asserting that the U.S.'s growing restrictions have made their products unreliable.<sup>26 27</sup>

**Adarga Analysis:** The recent implementation of additional restrictions by the U.S. Department of Commerce on HBM chips and semiconductor technologies signals a significant intensification of the technological rivalry between the US and China. We highlighted the potential for this measure in the very [first issue of Briefly](#), published on 9 August, following Bloomberg's report that the U.S. was considering expanding its export controls to include HBM chips.

It is almost certain that these measures aim to curtail China's progress in artificial intelligence (AI) and advanced technologies, where HBM chips play a critical role. HBM chips are essential components for AI accelerators, which are pivotal for training and running advanced machine learning models. By restricting access, the U.S. is likely seeking not only to impair China's ability to develop high-performance AI systems but also to strengthen its position in managing critical technology flows globally.

This move increases the pressure on U.S.-China relations and heightens the risk of escalating retaliatory measures. China's rhetoric around protecting its own national security and its immediate announcement of additional controls on critical materials like gallium and germanium, along with enhanced reviews for graphite exports, underscores this point. These materials are integral to semiconductor production and other high-tech applications, making their restriction a direct challenge to the U.S. and its allies or partners supporting these export controls.

As predicted in our earlier analysis, South Korean firms like SK Hynix and Samsung Electronics, which dominate the HBM market, are now caught in the crossfire. The Foreign Direct Product Rule (FDPR) potentially forces these companies to choose between their two largest markets: the U.S. and China. While existing agreements may shield SK Hynix in the short term, both companies could face significant challenges if the U.S. broadens restrictions to include bundled AI accelerators or enforces tighter compliance mechanisms. In contrast, the American firm, Micron, less exposed to China due to earlier bans on its memory chips in critical infrastructure, remains a less impacted player in the immediate term. However, even then, the realistic possibility of broader market disruptions and retaliatory risks could indirectly affect its long-term prospects.

As noted in the Xinhua commentary, Chinese firms directly affected by the controls, such as Empyrean Technology and NAURA Technology Group, are already working to mitigate the impact by focusing on self-reliance. Their investments in domestic research and development (R&D) and alternative supply chains highlight a medium-term strategy to reduce dependency on U.S. technologies. The implementation of these latest measures will likely accelerate this trend.

Among the strongest actions taken by the U.S. to limit China's ability to develop high-tech military applications since the CHIPS Act in 2022, these export controls are consistent with a trend of increasing securitisation of AI-enabling technologies, not only by the U.S. and China but also by other developed economies seeking to safeguard their strategic interests. While official statements from both sides frame these measures as necessary for national security, they likely extend to broader strategies to assert dominance over critical global supply chains in the context of techno-economic competition.

The timing of these actions, against the backdrop of heightened geopolitical tensions and the renewed focus on U.S.-China competition following President Trump's reelection in the November election, further underscores their symbolic and strategic importance. U.S. restrictions on China's access to advanced semiconductor technologies and HBM chips align with its overarching strategy to consolidate its technological and geopolitical edge. The latest restrictions are highly likely to exacerbate tensions between the two countries, with both sides engaging in escalating economic and trade countermeasures. However, the consequences reach far beyond bilateral relations. These measures ripple across global supply chains, imposing significant challenges on allied industries and innovation ecosystems through increased costs, disruption to production networks, and fragmentation of international collaboration in critical technologies.

While China faces immediate hurdles due to its reliance on imported semiconductor technologies, the longer-term effects may deviate from the U.S.' intended outcomes. By accelerating its focus on self-sufficiency and fostering domestic innovation, China could gradually reduce its dependency on U.S. technologies, ultimately reshaping the global semiconductor landscape and potentially undermining U.S. objectives. Such a scenario underscores the risks of overusing economic coercion as a tool of strategic competition, as it may incentivise adversaries to build independent capabilities, consequently eroding the very leverage the policies aim to secure.

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