

Market evolution: Semiconductor devices (CN 8541) — 2015–2025

Introduction

The EU's external trade in semiconductor devices (CN 8541) underwent a dramatic transformation between 2015 and 2025. While the aggregate export value rose by 36.8 % to €7.5 billion, imports surged by 79.4 % to €14.3 billion, pushing the trade deficit from –€2.5 billion to –€6.8 billion. Beneath these totals, the structure of trade changed profoundly: solar photovoltaic modules (CN 854143) flooded the import side, import prices collapsed, and the EU's supplier concentration soared. On the export side, the EU maintained its position in high-value transistors and opto-semiconductors, but lost ground in traditional markets while gaining in new ones. This report analyses the main dynamics, drawing exclusively on data from the EU Trade Dashboard.

1. The Photovoltaic Import Wave and the EU's Growing Reliance on China

A single product segment – assembled photovoltaic cells – accounts for the bulk of the import surge

Data from the product segment breakdown show that imports of “photovoltaic cells assembled in modules or made up into panels” (CN 854143) exploded from essentially nil in the early years to €8.0 billion in 2025, having peaked at €22.3 billion in 2022. The quantity of imported modules reached 4.46 million tonnes in 2025 (slightly down from a 2024 high of 4.64 million tonnes). This single heading dwarfed all other semiconductor imports, such as diodes (CN 854110, €1.2 billion in 2025) and high-power transistors (CN 854129, €2.5 billion in 2025).

China is the overwhelming source of the new imports, driving a sharp rise in supplier concentration

The top partners data reveal that EU imports from China rose from €2.6 billion in 2015 to €10.2 billion in 2025, with a spectacular peak of €25.6 billion in 2022. China's share of EU imports therefore went from roughly one-third to more than two-thirds. The HHI concentration index for imports jumped from 1 691 in 2015 to 5 178 in 2025, confirming a highly con-

centrated supply structure. By contrast, imports from traditional semiconductor suppliers such as Taiwan (–79 %), Korea (–63 %) and Malaysia (–28 %) shrank over the same period.

The massive inflow of panels caused import unit values to collapse

The aggregate import price fell from €20 150 per unit in 2015 to €3 176 in 2025 (–84.2 %), according to the overview trade data. The segment-level detail shows that panel prices (CN 854143) dropped from €5 094 per unit in 2022 to €1 785 in 2025 – a decline of 65 % in just three years. This indicates that the expansion of Chinese manufacturing capacity and fierce global competition exerted continuous downward pressure on the cost of solar equipment entering the EU.

2. Export Resilience in High-Value Components, but a Re-orientation of Destination Markets

Export values are sustained by steeply rising unit prices for advanced semiconductors, while volumes shrink

EU exports of CN 8541 rose from €5.5 billion to €7.5 billion despite total exported quantity falling from 280 000 to 254 700 units (–9.1 %). Consequently, the average export unit price jumped by 50.5 %, from €19 604 to €29 501, as reported in the overview. The product detail shows that high-power transistors (CN 854129) continue to dominate the export basket, with a value of €2.6 billion in 2025 and a unit price that rose from €209 000 to €301 000 between 2015 and 2025. The EU's production data also tell a story of upgrading: over the decade EU production quantity fell by 28.3 % while production value grew by 66.4 %, implying a shift toward higher-value-per-unit goods.

The United Kingdom's share collapsed, while China and Ukraine gained strategic importance

EU exports to the United Kingdom fell from €1.21 billion in 2015 to €406 million in 2025 (–66.3 %), a drop that reflects both Brexit-related trade friction and the UK's declining role as an electronics hub. Over the same period, exports to China climbed 130.2 %, reaching €1.71 billion in 2025, making China the EU's top export market for semiconductors. Exports to Ukraine, although from a low base, surged from €18 million to €132 million (+626 %), underlining the role of semiconductors in reconstruction and defence. Exports to the United States remained broadly stable at around €1 billion (+11 %) despite high price volatility.

Specialisation is concentrated in a handful of Member States

According to the revealed comparative advantage data for 2025, Slovenia (RCA = 4.8), Greece (2.9), Portugal (2.7), the Netherlands (2.0) and Austria (1.7) are the most specialised EU exporters in this sector. Germany, while not as specialised on a relative basis (RCA = 1.6), remains the largest exporter in absolute terms (€3.5 billion in 2025), followed by France (€862 million) and Italy (€628 million). The concentration of export activity among Member States is relatively low and declining, with the export HHI falling from 1 144 to 1 061.

3. Widening Trade Deficit, Volatility and Strategic Vulnerabilities

The trade deficit quadrupled, and net-import reliance became a structural feature

The EU's trade deficit in CN 8541 rose from –€2.5 billion in 2015 to a peak of –€24.0 billion in 2022, before settling at –€6.8 billion in 2025. The net-import reliance indicator (imports minus exports as a share of apparent consumption) increased from 3.2 % in 2015 to 9.9 % in 2025, after reaching 21.6 % in 2023. This shows that the EU has become structurally more dependent on imported semiconductors, particularly for the energy transition, even if the extreme spike of 2022-23 has partially receded.

Import supply sources show extreme volatility, while export price shocks reveal market disruptions

The volatility analysis of import quantities confirms that key photovoltaic suppliers are very unstable: the coefficient of variation (CV) for Thailand reached 1.79, Korea 1.15 and Taiwan 1.03, indicating boom-bust patterns in sourcing. On the export side, the price shock detection identified three major events: a price spike of 477 % in exports to South Africa in 2017 (linked to a quantity collapse), a 206 % price jump to the United States in 2018, and a 170 % increase to Morocco in 2020. These shocks reflect sudden changes in product mix or trade disruptions that affect small but strategic markets.

The EU's domestic production volume contracted, raising concerns about long-term manufacturing capacity

EU production quantity of semiconductor devices fell from 11.5 billion units in 2015 to 10.3 billion units in 2024 (–10 %, with an earlier low of 5.1 billion in 2023). At the same time, the value of production increased by 56 % (from €1.44 billion to €2.26 billion),

confirming a focus on higher-priced, usually more advanced devices. However, the sheer scale of photovoltaic imports — which are not matched by comparable EU-based production — means that the bloc's semiconductor trade is deeply lopsided, with domestic manufacturing concentrated in a narrow high-value segment while mass-market photovoltaics are almost entirely imported.

Conclusion

The EU's semiconductor trade over the 2015–2025 period tells a story of a clean-energy transition intertwined with growing strategic dependence. The import side has been radically reshaped by Chinese photovoltaic modules, causing a collapse in average import prices, a sky-rocketing supplier concentration, and a widening trade deficit. The export side has proven resilient, not because of volume growth but because the EU successfully moved its product mix towards high-value transistors, diodes and LEDs, even as it lost the UK market and sought new outlets in China and Ukraine. The decline in domestic production volumes and the extreme volatility of certain import sources highlight the need for the EU to carefully balance its pursuit of affordable green technology with the imperative of maintaining a secure and diversified supply chain for semiconductors.

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