



PFAS regulation in electronics manufacturing

Strategic implications for OEMs, PCB manufacturers and EMS providers – with a focus on Asian manufacturing markets

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Initial situation

PFAS regulation has emerged as one of the most significant regulatory developments affecting the global electronics industry. Although the legislative process is still ongoing, the topic is already becoming increasingly relevant for OEMs, PCB manufacturers, and Electronics Manufacturing Services (EMS) providers.

Per- and polyfluoroalkyl substances (PFAS) comprise a large group of fluorinated chemicals valued for their exceptional resistance to heat, chemicals, moisture, and harsh operating environments. As a result, they are used in numerous electronic materials and manufacturing processes.

Within the PCB and EMS industry, PFAS are primarily found in:

- PTFE-based high-frequency laminates for RF, radar, satellite, and 5G applications
- Fluoropolymer-based cable insulation and electrical insulation materials
- Selected seals, coatings, and protective surface treatments
- Certain process chemicals used in printed circuit board manufacturing

This Strategic Brief does not discuss the chemical characteristics of PFAS. Instead, it focuses on the strategic implications for global electronics supply chains and examines the potential consequences of future PFAS regulation for Asian PCB manufacturers, EMS providers, and their European customers. It also assesses whether manufacturers in Asia are already adapting their products, production processes, and sourcing strategies in anticipation of future regulatory requirements.

Regulatory status in the European Union

No comprehensive PFAS ban has yet been adopted in the European Union.

In January 2023, Denmark, Germany, the Netherlands, Norway, and Sweden jointly submitted a proposal to the European Chemicals Agency (ECHA) seeking restrictions on more than 10,000 PFAS substances under the REACH Regulation. Since then, the proposal has undergone several revisions following extensive scientific evaluation and public consultation. [1][2]

In August 2025, the submitting authorities published an updated background document that significantly expanded the original proposal. Among other changes, it introduced dedicated assessments for eight additional industrial sectors, including the electronics and semiconductor industries. Besides a complete restriction, the document also evaluates regulatory approaches that would allow continued use under defined conditions and transitional periods where technically justified. [1][2]

In March 2026, ECHA's Committee for Risk Assessment (RAC) adopted its scientific opinion on the proposal. Due to the significant economic implications, the Committee for Socio-economic Analysis (SEAC) subsequently conducted a 60-day public consultation, which concluded in spring 2026. Both committees are expected to submit their final opinions to the European Commission by the end of 2026. Based on these opinions, the Commission will prepare the legal proposal to amend Annex XVII of the REACH Regulation, which must subsequently be approved by the EU Member States through the REACH Committee. [1][3]

A noteworthy aspect of the consultation process is the exceptionally high level of participation from the electronics and semiconductor industries. Of the 3,511 comments submitted during the SEAC consultation, the largest share originated from these sectors, underlining the strategic importance of PFAS for electronic manufacturing. According to the current technical assessment, Regulatory Option

3—allowing continued use under clearly defined conditions rather than implementing a complete ban—is presently regarded as the most practical approach for many electronics and semiconductor applications. For several other sectors, including transportation and sealing applications, this option is considered significantly less suitable. [3][4]

From today's perspective, neither the final legal text nor binding transition periods have been defined. Nevertheless, it appears likely that certain applications considered technically critical—such as medical devices, aerospace, semiconductor manufacturing, and selected electronics applications—may receive temporary exemptions or application-specific requirements. Even though the regulatory process is expected to continue for several years, many companies have already entered a practical preparation phase.

Assessment

From a strategic perspective, the greatest risk is currently not a future PFAS restriction itself, but the uncertainty surrounding its final scope, implementation timeline, and possible exemptions.

Companies that postpone material assessments and qualification activities until the final legislation is adopted may face considerable time pressure. According to industry estimates, identifying suitable alternatives, qualifying new materials, validating manufacturing processes, and obtaining customer approvals in the electronics industry typically requires between two and five years. [5]

Consequently, PFAS has evolved from a purely regulatory issue into a strategic supply chain and technology management topic. Companies that begin evaluating their products, suppliers, and material portfolios at an early stage are likely to be significantly better positioned to manage future regulatory requirements while minimizing supply chain disruptions.

Impact on OEMs and EMS companies

Even a phased introduction of PFAS restrictions is expected to affect far more than material costs. It has the potential to influence product development, supplier management, qualification processes, and long-term sourcing strategies across the electronics industry.

Key implications include:

- **Material selection and product design:** Products based on PTFE high-frequency laminates—particularly for RF, radar, satellite, and 5G applications—may require redesign or requalification using alternative substrate materials.
- **Supplier transparency:** Suppliers will increasingly be expected to provide reliable evidence of whether PFAS are present in materials, components, or manufacturing processes. In many cases, this information must be traceable across multiple tiers of the supply chain.
- **Qualification of alternative materials:** While PFAS-free or reduced-PFAS alternatives are already available for many standard applications, equivalent solutions for demanding high-frequency applications often do not yet provide the same electrical performance. [6]
- **Higher qualification and validation effort:** Additional testing, documentation, certification, and customer approval activities are likely to extend development cycles and engineering change processes.

- **Growing obsolescence risk:** Materials currently used in established products may gradually become unavailable or subject to regulatory restrictions. As a result, PFAS is evolving into an important—yet often underestimated—obsolescence management issue.
- **Potential supply constraints:** Temporary shortages may occur for specialized high-frequency laminates if manufacturers shift production capacity toward PFAS-compliant materials.
- **Greater importance of second sourcing:** Dependence on individual laminate manufacturers or specialized material suppliers represents an increasing supply chain risk. Qualified alternative sources are therefore becoming strategically more important.
- **Impact on RFQs and supplier selection:** The ability to demonstrate PFAS compliance and the availability of qualified substitute materials are likely to become standard evaluation criteria when selecting PCB manufacturers, EMS providers, and material suppliers—similar to today's requirements for RoHS and REACH compliance.

Implications for Asian manufacturers

A significant share of the world's PTFE-based high-frequency laminates, fluoropolymer cable materials, and advanced PCB materials is manufactured in Taiwan, China, Japan, and South Korea. Although the proposed PFAS restrictions originate in Europe, they are likely to have implications far beyond the EU, particularly for export-oriented manufacturers.

Export requirements for the European market

Asian PCB manufacturers and material suppliers serving European customers—either directly through PCB exports or indirectly as part of electronic assemblies—will increasingly be required to demonstrate the PFAS status of their products throughout the supply chain. This is particularly relevant for manufacturers specializing in high-frequency laminates for 5G, radar, aerospace, automotive, and industrial applications. [7]

Managing different regulatory requirements

Manufacturers supplying both Asian domestic markets and the European Union may need to comply with different regulatory frameworks simultaneously. If PFAS restrictions are implemented only in selected markets, companies may be required to maintain separate product portfolios, manufacturing processes, or qualification programs, increasing operational complexity and costs.

Competitive opportunities for early adopters

Manufacturers that invest early in low-PFAS or PFAS-free materials may strengthen their competitive position. Several suppliers—particularly in Taiwan—are already promoting environmentally optimized materials and production technologies as part of their international market strategy. [8]

Implications for OEM and EMS procurement

For European OEMs and EMS providers sourcing materials or complete assemblies from Asia, PFAS compliance is becoming an additional supplier qualification criterion. Regardless of where manufacturing takes place, purchasing organizations are expected to place greater emphasis on transparency regarding material composition, documented regulatory compliance, and suppliers' ability to support future material substitutions. These factors are likely to become increasingly important in supplier selection and long-term sourcing decisions.

Are Asian manufacturers already responding?

Yes—but at different speeds, for different reasons, and within different regulatory frameworks.

Unlike the European Union, Asia does not currently have a comparable cross-sector PFAS restriction. Instead, developments are taking place on several parallel levels, ranging from national regulatory initiatives to market-driven industry responses.

Regulatory developments

China

As both the world's largest producer and largest consumer of PFAS, China plays a key role in shaping future market developments. Any significant regulatory changes in China would therefore have global implications.

At the provincial level, China has already taken initial regulatory steps. In 2025, Sichuan became the first province to introduce discharge limits for PFOA and PFOS in chemical industrial parks. [9]

At the national level, the Chinese government is preparing additional measures that would classify selected long-chain PFAS as restricted or prohibited substances under its national chemicals management framework. [10]

Separately from PFAS regulation, China also announced a major expansion of China RoHS in 2026. Beginning in August 2027, an additional 23 product categories will become subject to the highest level of compliance requirements, with implications for supply chains involving plastics, wiring, adhesives, and other materials used in electronics manufacturing. [11]

Japan and Singapore

Both countries are pursuing their own PFAS regulatory initiatives, although at different stages of implementation.

Singapore is expanding licensing, reporting, and use restrictions for long-chain PFAS and plans to phase out PFAS-containing firefighting foams from 2026 onwards. Japan is preparing comparable classifications of long-chain PFAS as restricted substances within its national regulatory framework. [10]

Taiwan

In 2025, Taiwan's Ministry of Environment published a draft regulation identifying 269 PFAS substances as chemicals of very high concern. The regulation is scheduled to enter into force on 1 January 2026, followed by a two-year transition period for manufacturers, importers, and distributors, including companies serving the electronics industry.

The proposed substance list is largely aligned with OECD recommendations and the EU REACH classification. [12]

Australia

Australia is already implementing PFAS restrictions under its industrial chemicals framework. Companies are required to establish substance inventories, reformulate products where necessary, and update safety documentation. Similar approaches are increasingly being considered elsewhere in the Asia-Pacific region. [10]

Industrial developments

Regulatory initiatives are being accompanied by gradual changes across the electronics materials and manufacturing industry, although progress varies considerably between companies and product segments.

Several manufacturers of high-frequency laminates—particularly in Taiwan—are developing low-PFAS or PFAS-free materials for standard applications. However, according to current industry.

assessments, technically equivalent alternatives for demanding high-frequency applications with very low dielectric constant (Dk) and dissipation factor (Df) are not yet widely available. [6][7]

Some PCB manufacturers are also positioning environmentally improved manufacturing processes and material technologies as a competitive differentiator in international markets. This indicates that the ability to meet future PFAS requirements is increasingly being viewed as a commercial advantage rather than solely a regulatory obligation. [8]

In parallel, international testing, certification, and regulatory service providers operating in China, Japan, South Korea, and Taiwan have significantly expanded their PFAS-related consulting and compliance services. This development can be interpreted as a clear indicator of growing industry demand. [3]

Assessment

Developments across Asia are clearly underway, but they remain fragmented and are largely driven by external factors rather than by a coordinated regional strategy.

Current drivers include national environmental and public health objectives, customer requirements from international export markets, and the strategic ambition of individual material manufacturers to strengthen their competitive position through technological innovation.

For European OEMs and EMS providers, this means that neither the size nor the technological capability of an Asian supplier alone is a reliable indicator of its PFAS preparedness. Instead, transparency regarding material composition, regulatory compliance, and long-term substitution capabilities is becoming an increasingly important element of supplier qualification and risk assessment.

Strategic implications for supplier selection

PFAS is likely to become more than a regulatory compliance issue. For OEMs, it is expected to evolve into an additional criterion for strategic supplier evaluation.

Alongside established selection criteria such as quality, technological capability, manufacturing capacity, and delivery performance, the ability of PCB manufacturers, material suppliers, and EMS providers to demonstrate material transparency, regulatory compliance, and long-term substitution capabilities is likely to gain increasing importance.

As a result, PFAS-related capabilities may become an integral part of future RFQs, supplier qualification processes, and strategic sourcing decisions.

Conclusion

Although the final PFAS regulatory framework in the European Union has not yet been adopted, its potential implications for the electronics industry are already becoming increasingly apparent.

For OEMs, the issue extends beyond regulatory compliance. Future competitiveness may also depend on how effectively companies assess material risks, qualify alternative technologies, and work with suppliers capable of adapting to changing regulatory requirements.

At the same time, developments in Asia demonstrate that manufacturers are already responding—albeit at different speeds and through different approaches. While no harmonized regulatory framework comparable to the European Union currently exists across Asia, regulatory initiatives, material innovation, and increasing compliance activities indicate that the industry has entered a period of gradual transformation.

The final scope of future PFAS restrictions remains uncertain. Nevertheless, companies that begin evaluating their products, suppliers, and sourcing strategies today are likely to be better prepared to manage future regulatory changes while strengthening the long-term resilience of their electronics supply chains.

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About the EMS Strategy Group

EMS Strategy Group supports industrial enterprises in the strategic and operational advancement of their electronics manufacturing. Our core expertise lies in the strategic relocation of manufacturing volumes, the selection of qualified EMS partners, the establishment of new production capacities, and the expansion of existing manufacturing structures.

Furthermore, we design resilient supply chain frameworks, conduct comprehensive risk assessments, and guide dual-sourcing strategies, with operational support through to a successful series production ramp-up.

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