

INDUSTRY WHITEPAPER | 2026

FFKM Supply Chain Risk: What Semiconductor Manufacturers Need to Know

The structural vulnerabilities behind the 2021–2023 FFKM shortage remain unresolved, and the risk in 2026 is more acute than ever.

Executive Summary

Between 2021 and 2023, the semiconductor industry faced an acute shortage of FFKM seals, the o-rings and gaskets used in virtually every piece of fab process equipment. It ended only because demand softened in the downcycle. None of the causes were fixed. The companies that weathered it best had a dual-qualified second source.

5 structural failures hit at once	16–24 wks lead times for standard sizes	55%+ of global fluorspar controlled by China	2 primary FFKM suppliers remain
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What Happened — and Why It Will Happen Again

- Demand surge:** Explosive semiconductor demand drove FFKM consumption beyond available capacity.
- Plant closures:** A key FFKM facility closed in Q4 2021 and a Russian plant shut down in 2022, triggering force majeure.
- Precursor disruption:** Russia supplies nearly one-third of global carbon black, a key FFKM ingredient. Sanctions spiked prices.
- Energy rationing:** Chinese electricity rationing curtailed production of key FFKM raw material intermediates.
- Permanent capacity loss:** 3M exited all PFAS and fluoropolymer production, including Dyneon FFKM, by end of 2025.

Who Was Most Impacted

Large OEMs with long-term agreements (Applied Materials, Lam Research, Tokyo Electron) got priority allocation. Everyone else waited.

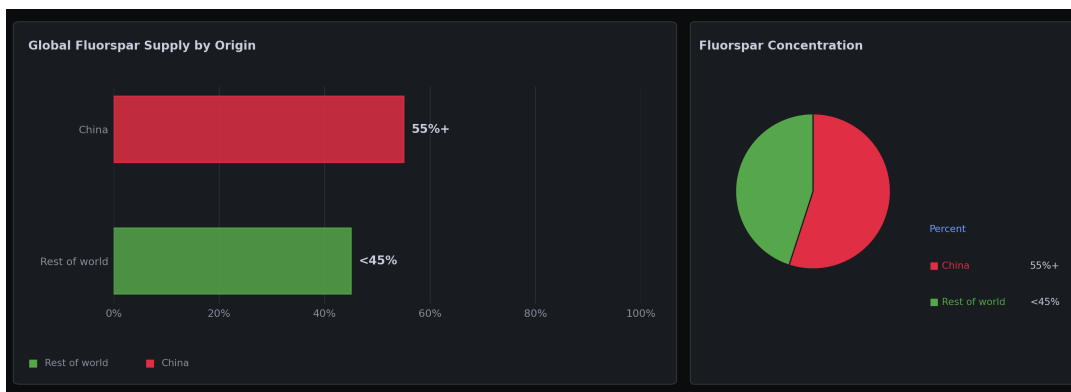
- Vacuum component manufacturers:** slit valves, gate valves, and chambers could not ship. Lines stalled.
- Smaller OEMs and contract manufacturers:** 16–24 week lead times for standard sizes, longer for custom.
- Asian manufacturers:** longer logistics and lower priority in a US/European-dominated supply chain.
- Distributors:** Kalrez® and Chemraz® allocations cut; existing orders went unfilled.

Even Greene Tweed, one of only two primary FFKM suppliers, had to reformulate its own Chemraz® products mid-crisis.

Current Risk Assessment — 2026 and Beyond

The shortage ended in 2023 only because demand softened. None of the structural vulnerabilities were resolved.

Risk Factor	Level	Implication
3M Dyneon Exit	Critical	Permanent capacity loss. Market is now effectively two suppliers.
China Fluorspar Control	Critical	55%+ of the upstream raw material for all FFKM sits in one country.
US-China Trade War	High	2026 tariffs and export controls at their highest level since 2019.
CHIPS Act Demand Surge	High	New fabs online 2025–2027 push demand past 2021 levels.
TFE Capacity Constraints	High	The core FFKM precursor; new capacity takes years. None in the pipeline.
Single-Source Dependency	High	Most OEMs specify one FFKM brand with no qualified fallback.



The Mitigation: Qualify a Second Source Now

Qualification takes engineering validation, testing, and sometimes customer notification. Do it before the next shortage, not during it. **MCM evolast® FFKM** is Italian-made with a fully independent European supply chain, not exposed to Chemours' US constraints or Greene Tweed's feedstock dependencies. Moss Seal is its exclusive U.S. distributor.

7 semiconductor-specific grades: plasma etch, CVD, ALD, wet chem, UHV	0.02 ppm published TDS outgassing	ISO 6/7 cleanroom manufacturing as standard
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Now Accepting Beta Qualification Partners

Evaluate MCM evolast® FFKM in your own process environment. Partners receive engineering support, technical documentation, and sample material at no charge, in exchange for performance feedback. Ideal for OEMs, vacuum component makers, and high-purity systems builders currently specifying Kalrez® or Chemraz®.

Daniel Cole · dcole@moss-seal.com · (713) 699-1344