



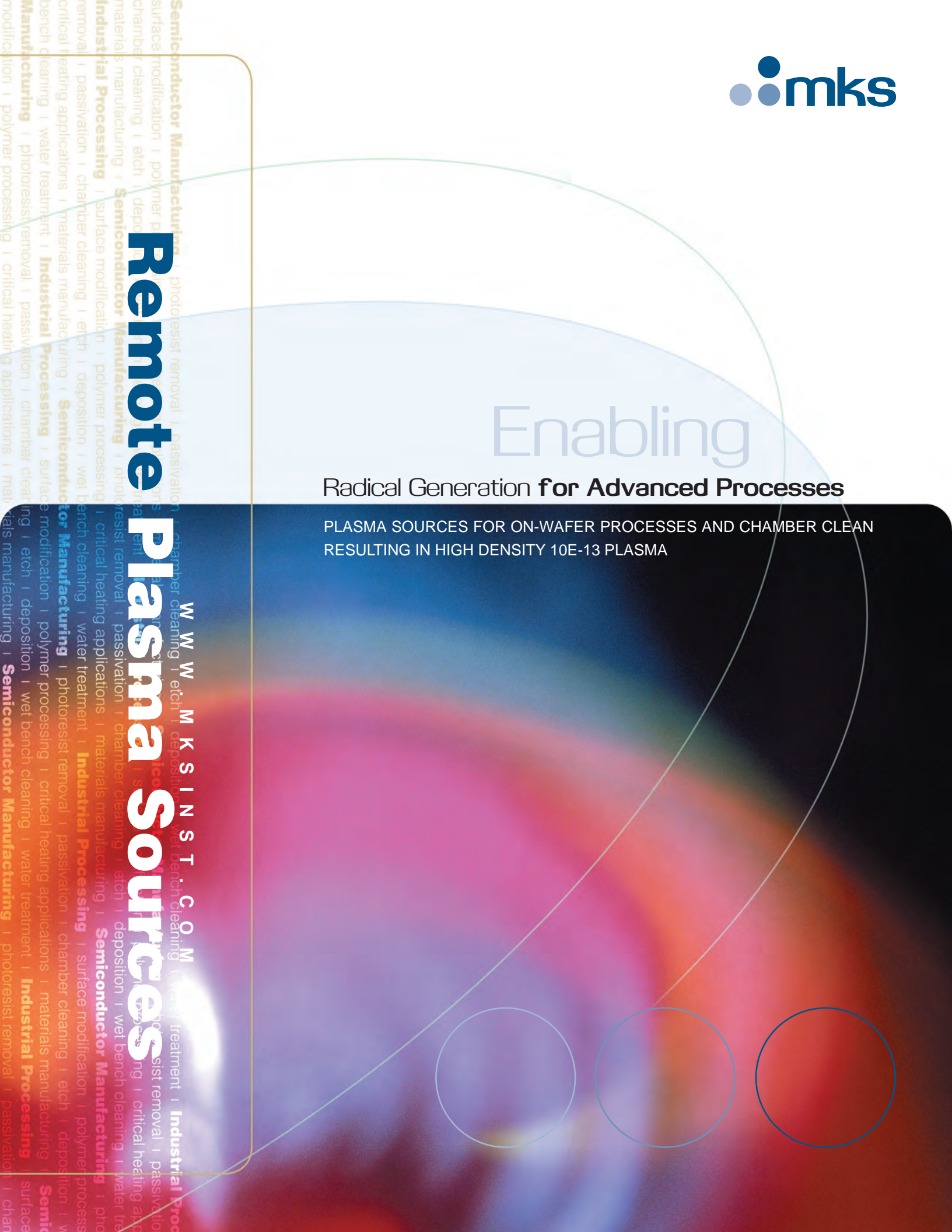
Enabling

Radical Generation for Advanced Processes

PLASMA SOURCES FOR ON-WAFER PROCESSES AND CHAMBER CLEAN
RESULTING IN HIGH DENSITY 10E-13 PLASMA

Remote Plasma Sources

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Remote Plasma Sources

Chamber Clean

Paragon® Remote Plasma Source — The Paragon® Remote Plasma Source reactive gas generator is designed for NF_3 flows up to 8 slm and pressures up to 10 Torr. The Paragon Remote Plasma Source is based on MKS patented Low-Field Toroidal plasma technology that efficiently couples RF power into the plasma while maintaining very low electric fields. It incorporates a large radii geometry torus and a patented gas injector with a PEO-coated plasma block for ultra-clean performance with low erosion rates, extended block life, superior plasma uniformity and a dissociation rate greater than 98%. Recognized as a proven technology in remote plasma sources for advanced deposition equipment, the Paragon Remote Plasma Source has faster clean times and increased productivity, with the lowest cost per radical volume, compared to competitive alternatives. The Paragon Remote Plasma Source may be configured with the EtherCAT® communication protocol to allow data streaming of key operating parameters to enhance process diagnostic capabilities, process monitoring on the chamber or process equipment.

The primary application for the Paragon Remote Plasma Source is deposition chamber cleaning using the generation of atomic fluorine radical that chemically react with excess film deposits to remove them from the chamber without harming the process chamber or its components. As new process materials are introduced in the deposition application, the expanded capabilities of the Paragon Remote Plasma Source operates with other gas species such as oxygen, hydrogen, nitrogen, and other gas mixtures to address processing for the advanced technology nodes.



On-wafer Processes

R*evolution® Remote Plasma Source — The R*evolution® Remote Plasma Source is based on Low-Field Toroidal plasma technology with an integrated, actively cooled fused quartz plasma chamber and operates efficiently over a vast range of gas flows and pressures. Leading the way in oxygen radical-based applications, the quartz plasma chamber of the R*evolution Remote Plasma Source supports optimal dissociation rates for oxygen radicals and is a reference for plasma source photoresist removal applications in semiconductor equipment.

MKS offers continuous improvements to the product line, focusing on productivity with higher flows, true power control for wafer-to-wafer repeatability and equipment chamber matching. The compact, single self-contained unit allows for integration. EtherCAT® communication is available to support advanced semiconductor manufacturing controls with data reporting and monitoring.

On-wafer Processes

High Power Microwave Plasma System — The High Power Microwave Plasma System is an exceptionally productive manufacturing solution operating at a frequency of 2450 MHz with up to 6 kW of power. This plasma system includes the generator with isolator, auto-tuning system comprised of the Precision Power™ Detector and SmartMatch® unit, and the microwave plasma source.

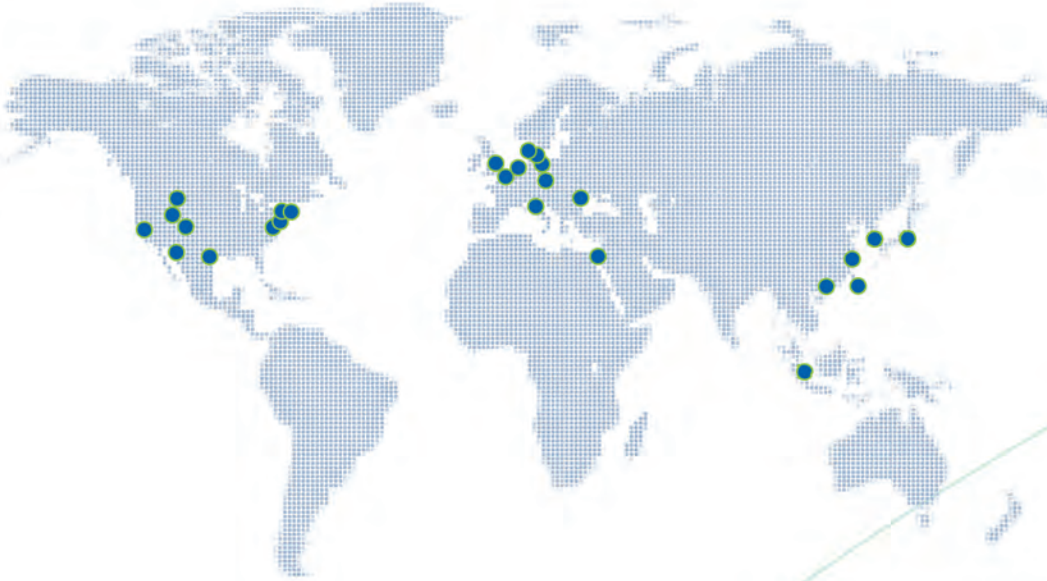
This comprehensive High Power Microwave Plasma System delivers a $10E-12$ – $10E-13$ radical concentration with low electron temperatures for the highest dissociation and lowest recombination rates. With the ability to ignite in various process gases over a wide operating range within seconds, the plasma system is compatible with current and advanced applications such as photoresist removal post-HDIIS implant, advanced surface cleaning and conditioning, and advanced deposition applications. Its precise closed loop power control has less than 1% of Full Scale accuracy variation, ensuring greater manufacturing repeatability wafer-to-wafer and equipment to equipment.



Product	Compatible Chemistries	Chamber Clean		On-wafer Processes		
		CVD	ALD	Strip/Photoresist Removal (On-wafer Clean)	Selective Etch (On-wafer Pre-clean)	Deposition (Oxidation/Nitridation)
Paragon	NF ₃ , O ₂ mix	• ○	• ○			
R ^{evolution}	O ₂ , N ₂ , O ₂ : N ₂ H ₂			•		•
Microwave	O ₂ , N ₂ H ₂ , N ₂ , H ₂ O, NH ₃ , H ₂			•	•	•

• Semi ○ Display

Global Locations



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Remote Plasma Sources Line Card - 1/2018

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cleaning | etch | deposition | wet bench cleaning | water treatment |
materials manufacturing | **Semiconductor Manufacturing** | photoresist removal | chamber cleaning | polymer processing | critical heating applications | water treatment |
Industrial Processing | passivation | etch | deposition | wet bench cleaning | **Semiconductor Manufacturing** | etch | deposition | wet bench cleaning |
removal | passivation | chamber cleaning | materials manufacturing | **Semiconductor Manufacturing** | surface modification | polymer processing |
critical heating applications | water treatment | **Industrial Processing** | photoresist removal | passivation | chamber cleaning | etch | deposition |
Manufacturing | photoresist removal | passivation | chamber cleaning | **Semiconductor Manufacturing** | surface modification | polymer processing |
modification | polymer processing | critical heating applications | materials manufacturing | etch | deposition | **Industrial Processing** |
materials manufacturing | **Semiconductor Manufacturing** | photoresist removal | passivation | chamber cleaning | polymer processing |
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