



Better technology. Better results.



Litmas™ RPS
1501 and 3001

Integrated plasma
source and power-
delivery system

Benefits

Reduces charge damage to fragile device structures, enabling higher yields

Generates high reactive specie fluxes, delivering higher process rates

Broadens the range of process chemistries, enabling a wide range of applications

Provides fast matching, stable power delivery for precise process control

Comprises one small-footprint package, providing reduced CoO

Features

Delivers reactive gas species to the process chamber

Provides the highest available plasma power density

Uses durable SiO₂ or Al₂O₃ chamber materials

Uses patented LitmasMatch™ solid-state power-delivery topology

Integrates the power supply, match, and plasma chamber in one package

The Litmas™ Remote Plasma Source (RPS) delivers high concentrations of reactive gas species to enable advanced process applications, such as wafer pre-clean, photoresist strip, and thin-film deposition. Its small footprint, high performance, ease of use, and low cost of ownership allow you to focus on developing critical plasma-based processes with lower device damage, higher throughput, and higher yields.

As new process capabilities enable next-generation semiconductor products with increasingly smaller and denser geometries, process engineers require technology solutions that can turn complex industry demands into simple realities. Advanced Energy® introduces its Litmas RPS, a high-technology, linear-inductive remote plasma source designed for outstanding performance in your wafer pre-clean, photoresist strip, and thin-film deposition applications.

Performance Excellence in Advanced Process Applications

The Litmas RPS source enables new processes required for smaller feature geometries. In fact, the Litmas RPS allows you to more precisely control your critical plasma processes for higher-quality films and improved yields.

Pre-Clean

In wafer pre-clean applications, the Litmas RPS utilizes a confined plasma to generate reactive gases that gently remove hydrocarbons, water vapor, native oxides, and other undesirable substances from the wafer surface.

Eliminating these contaminants, which can induce point or film property defects, will result in higher yields in your advanced sub-90 nm and 300 mm deposition processes.

Photoresist Strip

With dry strip (ashing) processes, etch species produced in the Litmas RPS chemically react with photoresist on the wafer surface to produce volatile etch products. Unlike in-situ photoresist strip sources, the remote Litmas RPS source eliminates any ion charging damage that could reduce device yields.

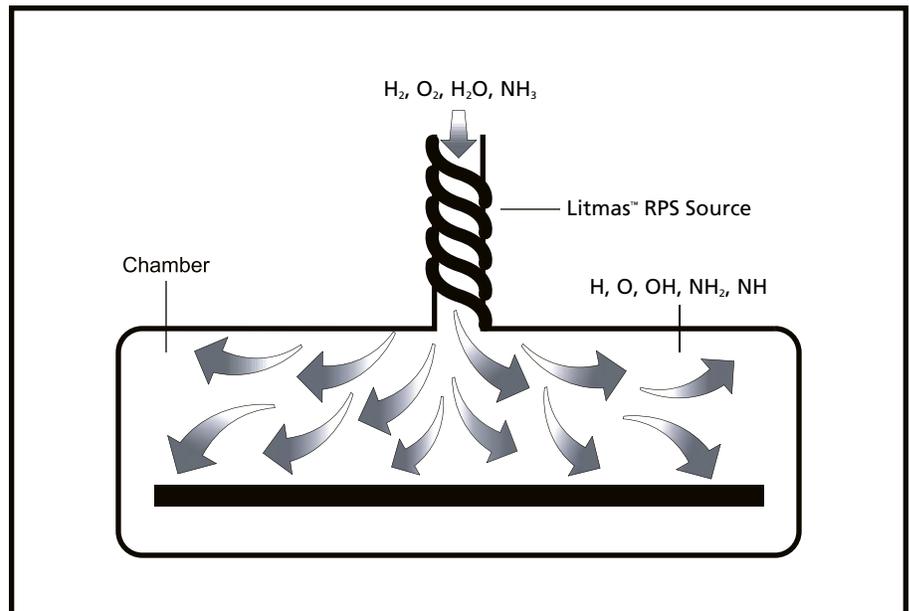
Thin-Film Deposition

In thin-film deposition applications, such as PEALD, PECVD, and PEPVD, the Litmas RPS helps you precisely and rapidly deposit ultra-thin, low-defect, high-k dielectric or liner/barrier films on the wafer surface. By utilizing a remote plasma to pre-dissociate active chemical species, you can optimize your film properties and deposition rates.

Typical Applications

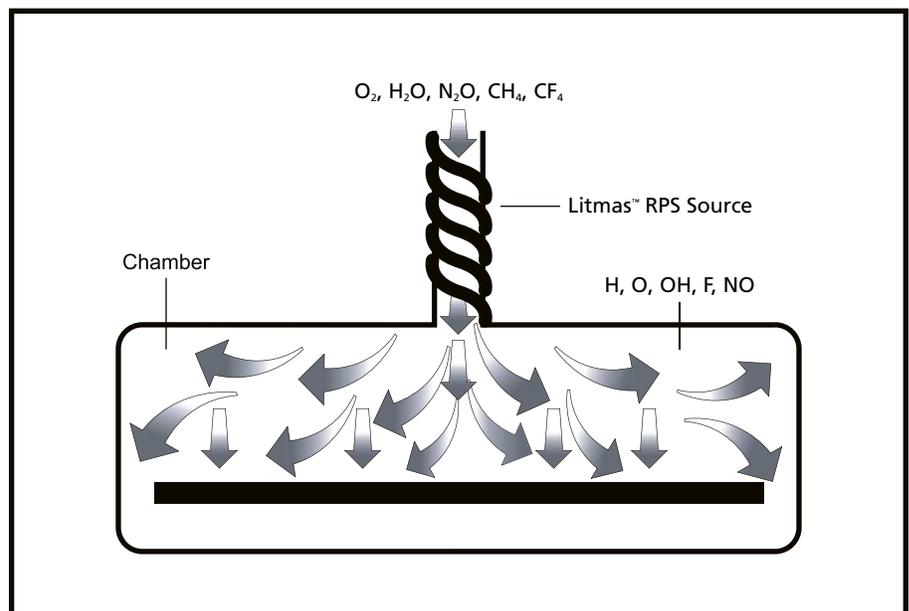
Wafer Pre-Clean

- PVD, CVD, SACVD, and LPCVD pre-clean
- Epitaxial growth
- Molecular beam epitaxy



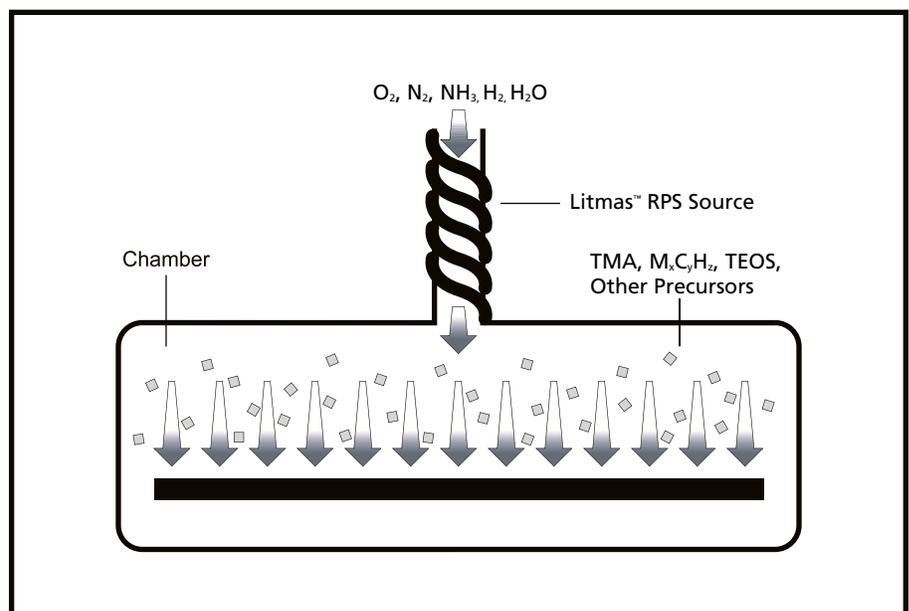
Photoresist Strip

- Photoresist strip (ashing) by reactive, oxygen-bearing gases
- Remote, plasma-enhanced etching



Thin-Film Deposition

- Remote PEALD, PECVD, PEPVD, and PERIE
- Liner/barrier film deposition
- Epitaxial deposition
- Nitridation, oxidation, and/or reduction of deposited films



Innovative, Integrated Design

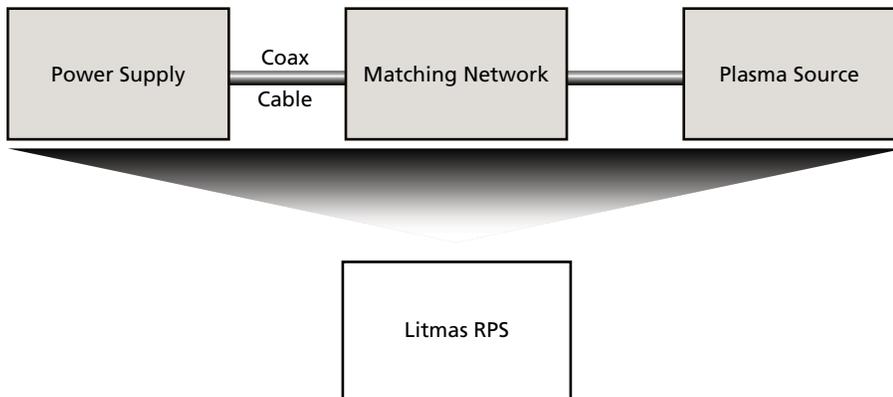
Engineered to offer a uniquely wide operating window for maximum process development flexibility, the Litmas RPS combines advanced power and source technologies in a fully integrated, compact design.

Theory of Operation

AE's Litmas RPS is an inductively-coupled plasma source featuring an integrated ~2 MHz power-delivery system. It produces a high-density plasma that dissociates inert process gas into reactive species which flow out of the unit and perform work on substrates placed downstream of the source. One of the features of a remote, inductively-coupled plasma source is that, in general, charged plasma species are confined within the plasma chamber and only charge-neutral species flow from the source and interact with the substrate.

Revolutionary Power and LitmasMatch™ Technology Results in Uniquely Wide Operating Range

Unlike traditional plasma-generation technologies, the Litmas RPS eliminates the 50 Ω power supply, and the associated cable and variable capacitor matching network, from the system design.

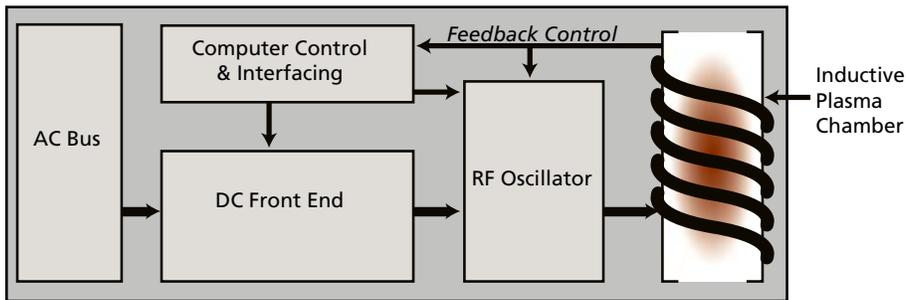


The Litmas™ RPS replaces three separate components

Instead, the revolutionary LitmasMatch™ technology directly couples electrical energy to the plasma chamber by varying the frequency of the power supply. As the plasma load changes (with changes in pressure, gas mixture, or power set point), a patented feedback and control circuit adjusts the RF frequency within a few cycles to always maintain efficient operation.

Low Surface Area Quartz or Alumina Plasma Chamber Results in a Broad Range of Process Chemistries

The patented water-cooled Litmas RPS plasma chamber handles up to 3 kW in a low surface-to-volume ratio geometry, allowing maximum reactive species production efficiency. Two choices of plasma chamber material are compatible with a wide range of process gases.



Litmas™ RPS detailed integrated design

Compact and Versatile For Any Process Environment

The Litmas RPS is compact in size for easy installation and seamless integration into your new or existing processes. The small product footprint and unique exit flange design, which can be flush mounted or remotely mounted, maximize your chamber design flexibility. Its lack of external air exchange allows mounting of the Litmas RPS within non-vented enclosures and makes it uniquely suited to operate in both ultra-clean semiconductor environments as well as challenging industrial environments. These qualities, when coupled with the wide operating range, can significantly reduce time to market for new process chambers.

The Litmas RPS 1501 is ideal for moderate flows and pressures (typically < 1.5 slm total flow rates, < 1 Torr operating pressures). The Litmas RPS 3001 operates at high flows (typically < 3 slm) for maximum process rates. See the Litmas RPS *Technical Specification* available at www.advanced-energy.com for actual operating ranges using various gases. Contact your AE representative for more information.

Communication Options

The Litmas RPS interfacing options include analog and RS-232 (AE Bus). Its RS-232 interface, when used with the optional AE Virtual Front Panel (VFP) software package, allows full data-logging capabilities of almost all internal source parameters and fault conditions. Contact your AE representative for more information.

Reliability & Compliance

The Litmas RPS is designed for robust usage and long life. Extensive self-protection features protect the unit from unintentional misuse, while conservative component deratings ensure that the unit is always operating safely within its mechanical and electrical limits. The Litmas RPS has a demonstrated MTBF of > 100,000 hours in AE's internal testing laboratory, and it has received the following safety certifications:

- CE 73/23/EEC & 89/336/EEC
- IEC/EN 61010-1
- CSA C22.2 No. 1010.1
- ANSI/ISA-82.02.01
- NRTL/C
- SEMI S2-0302
- SEMI F47

- EN 55011, EN61326, and 47 CFR

Value-Added Options

Virtual Front Panel

AE's optional Virtual Front Panel (VFP) graphical computer interface gives you the ability to perform critical functions dynamically and in real time:

- Process setup
- Troubleshooting
- Operational control
- Data logging

Gas Feed Accessory

In order to optimize the operating range and stability of the Litmas RPS, Advanced Energy offers a specialized gas distribution flange. Contact an AE representative for details and availability.

Foreline Process Abatement Capability

When combined with an additive gas delivery system (GDS) and installed on the foreline of etch tools, the Litmas RPS technology provides a high-performance, zero-footprint, low CoO solution to etch tool PFC abatement. For more information on this capability, please visit our website (www.advanced-energy.com).

Product Training

Our commitment to you goes beyond delivering a world-class plasma source. We offer advanced product training, so you can use the advanced capabilities of the Litmas RPS to their fullest in optimizing your current and future processes.

Specifications

Physical	
Dimensions	26.4 cm x 40.4 cm x 27.4 cm (10.4" x 15.9" x 10.8")
Weight	22 kg (49 lb)
Flanges	ISO63, tapped, or flush 3-bolt

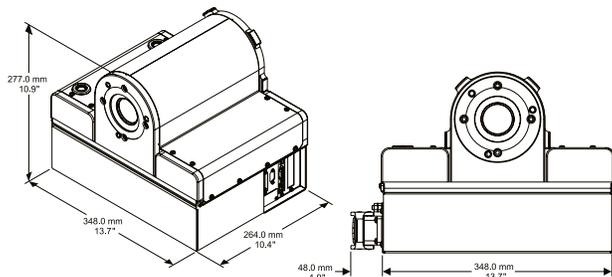
Electrical	LB-1501	LB-3001
AC Power	208 VAC nominal, 3 ϕ , Harting® HAN® 6 HsB, male, 6-pin, 35 A	
AC Line Frequency	50/60 Hz nominal	
AC Input Current	8 A max 10 A breaker	16 A max 20 A breaker
RF Frequency	~1.7 to 3.0 MHz	
Power*	100 to 1500 W, continuously adjustable	100 to 3000 W, continuously adjustable
Interfaces	Analog (25-pin), RS-232 (AE Bus)	

* Maximum power may not be achieved under all conditions, or with all process gases.
See *Typical Litmas RPS Operating Ranges* in the *Technical Specification* for actual data.

Environmental	
Cooling Water	SS female SAE 9/16", 18 straight-thread
	1.0 gpm (3.8 lpm) at 35°C (95°F)
Operating Temperature	+5 to +40°C (+41 to +104°F)

Dimensional Drawing

Note: Drawings are for reference only. Complete dimensional drawings are available from AE.



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SL-LitmasRPS-230-05 0M 5/06

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