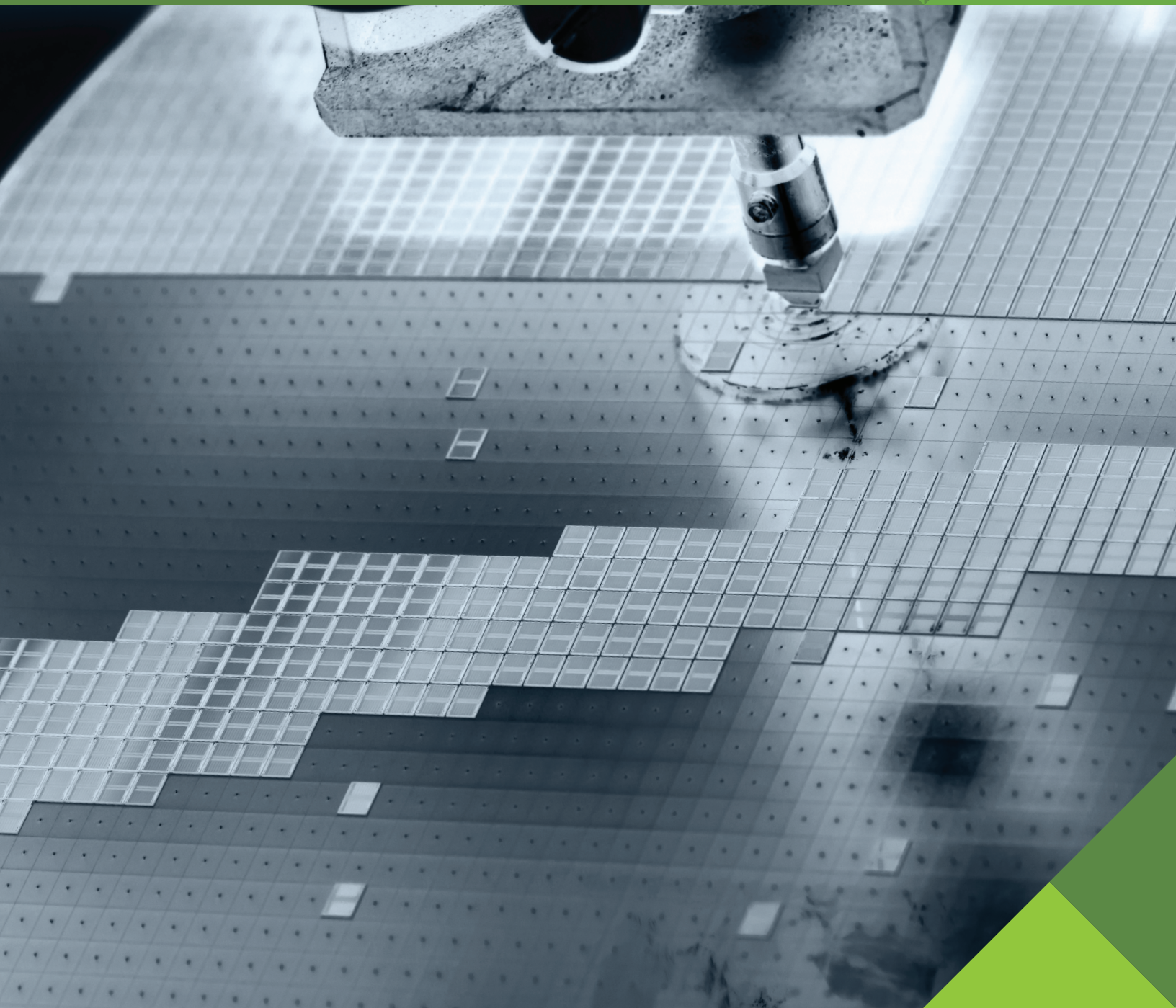


eVoS™

ASYMMETRIC BIAS WAVEFORM GENERATOR

DIRECT CONTROL OF SUBSTRATE VOLTAGE AND ION ENERGY DISTRIBUTION





eVoS Asymmetric Bias Waveform Generator

Optimize bias performance with direct control of wafer-surface voltage and ion energy distribution.

eVoS

Asymmetric Bias Waveform Generator

Shrinking chip dimensions and high-aspect-ratio structures demand exacting control of ion energy.

With the eVoS™ platform, AE introduces a paradigm shift in bias technology. By maximizing the ability to tailor ion energy, eVoS enables precise command of etch and deposition geometries at very small dimensions. Direct control of wafer-surface voltage and ion energy distribution (IED) empowers process engineers to optimize bias performance for specific process results, ensuring sensitive feature formation. In addition, fast digital metrology and novel control algorithms enable the generation of narrower IEDs compared to alternative technologies. These capabilities change what's possible in plasma processing.

BENEFITS

- Improved process control
- Direct control of wafer-bias voltage and resulting ion energies
- Narrow ion energy distributions
- High-precision ion energy selection
- Improved etch rate with less input power
- Streamlined system design and integration

FEATURES

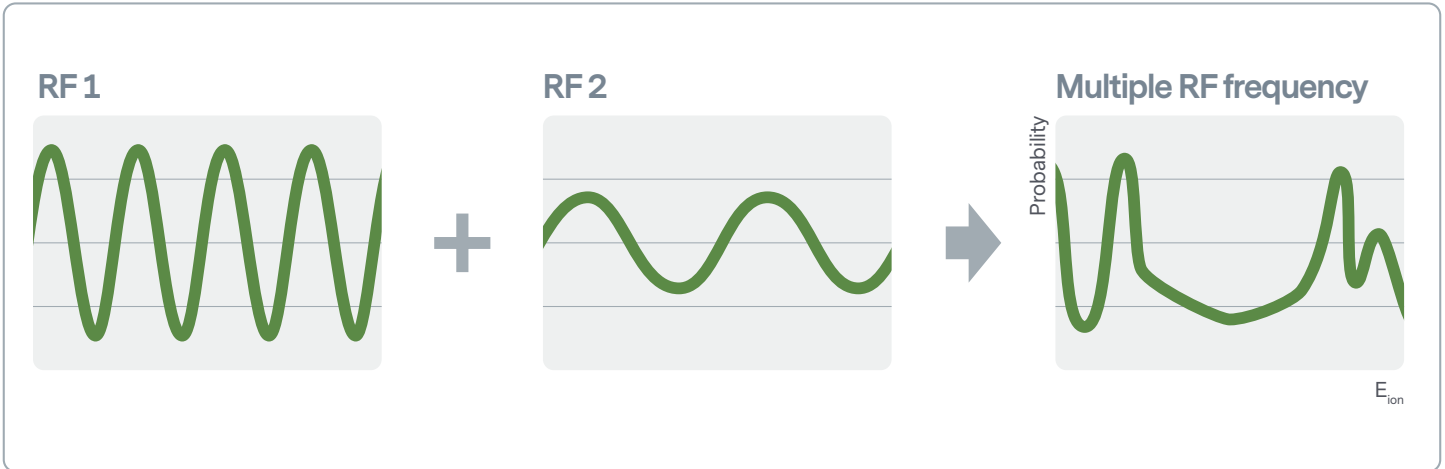
- Real-time bias voltage and ion current feedback
- Optimized waveform for ion energy control
- High-speed metrology
- Multi-level pulsing with fast DC-level response
- Input and output signals for pulse synchronization
- Closed-loop control
- EtherCat® communication
- High efficiency



Beyond RF: Precision Ion Energy Distribution Control

Traditional RF: Limited Ion Energy Control

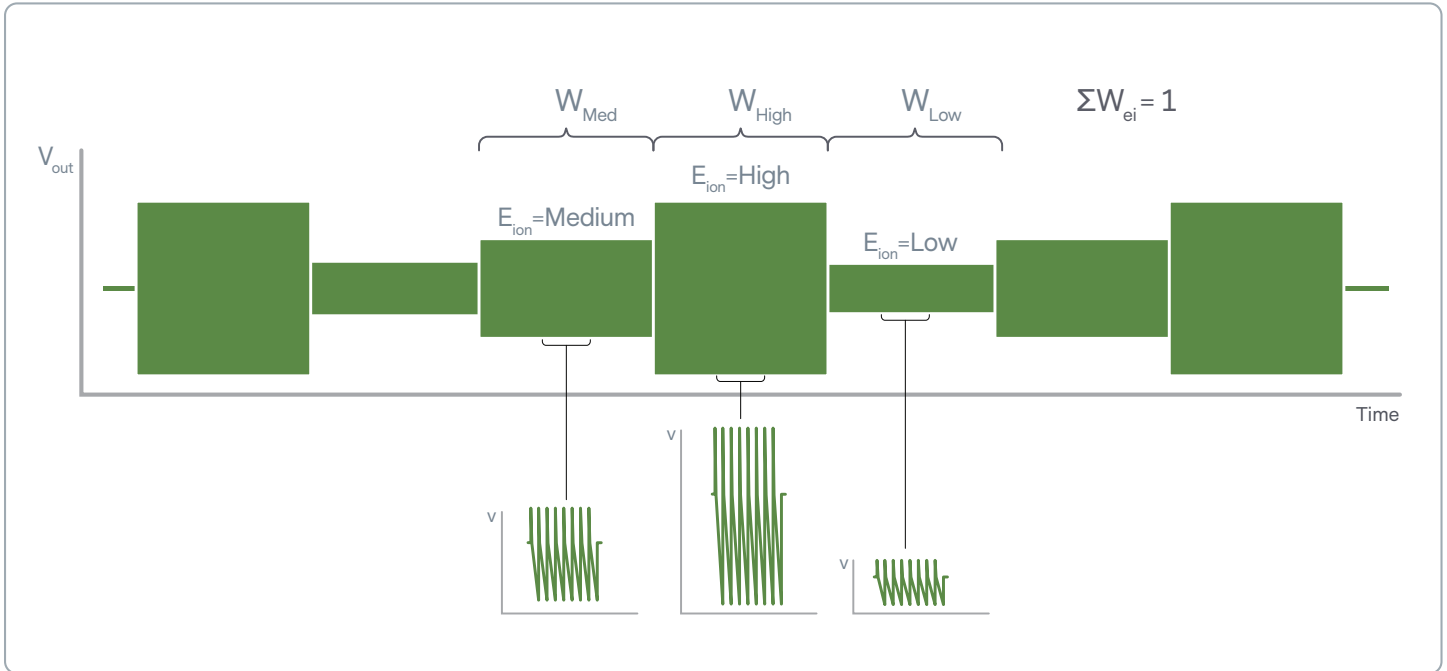
Multiple frequencies interact to create ion energy distribution; scaled multi-frequency RF solutions have limited ability to independently control distribution mean and spread.



eVoS: Tailored Ion Energy

A tailored waveform produces narrow ion energy distribution, pinpoint accuracy, and almost unlimited ability to tailor ion energy.

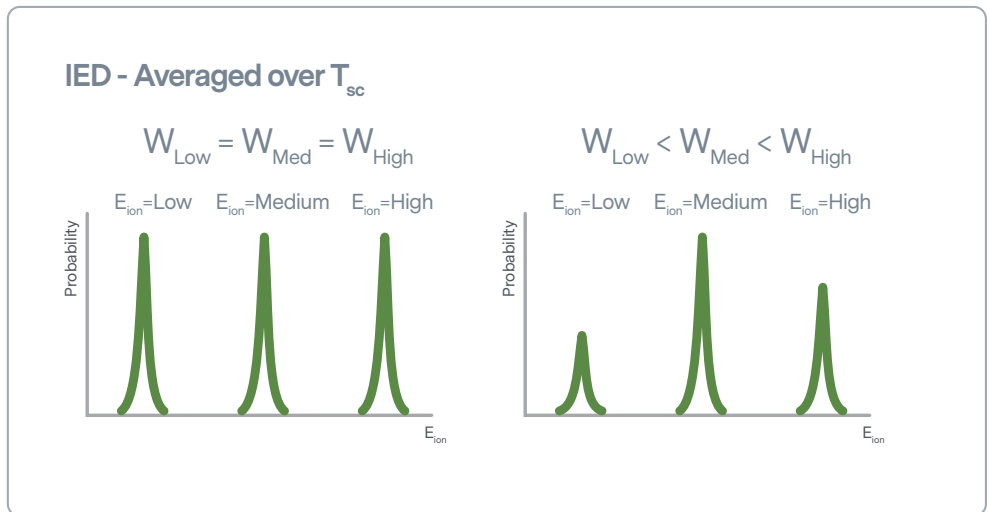




eVoS Pulsing and MLP-Like Functionality

Multi-energy operation by output modulation

- Energy levels assigned weighting to achieve time-independent control of individual energy fractions
- User-defined weighting and super-cycle timing interval



The scaled multi-frequency RF approach to biasing is reaching an endpoint.

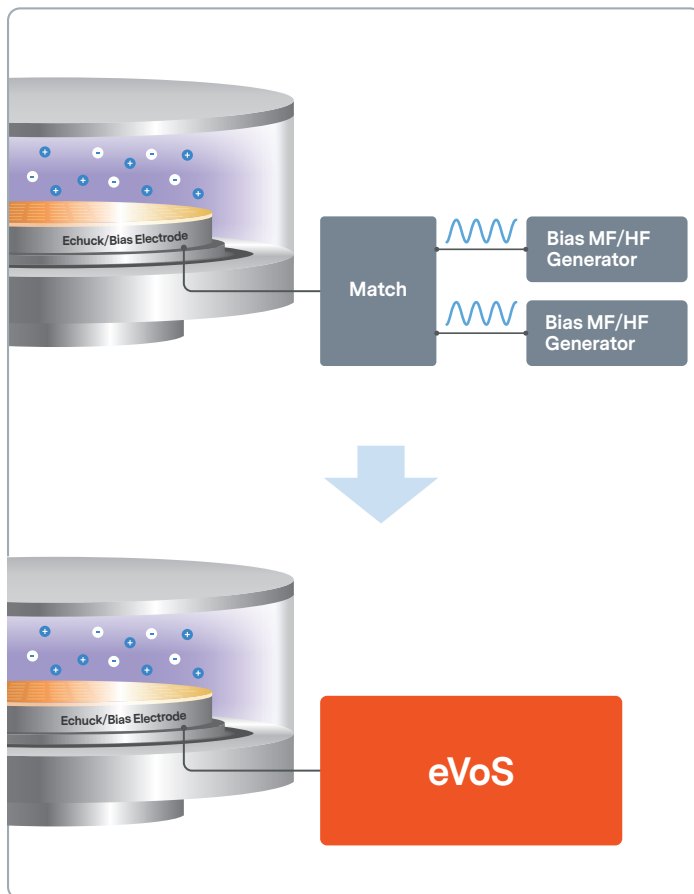
Beyond RF: Streamlined System Design

Conventional RF biasing systems are becoming more complex to meet intensifying process requirements. As this approach scales up, it draws closer to an endpoint by excessively increasing:

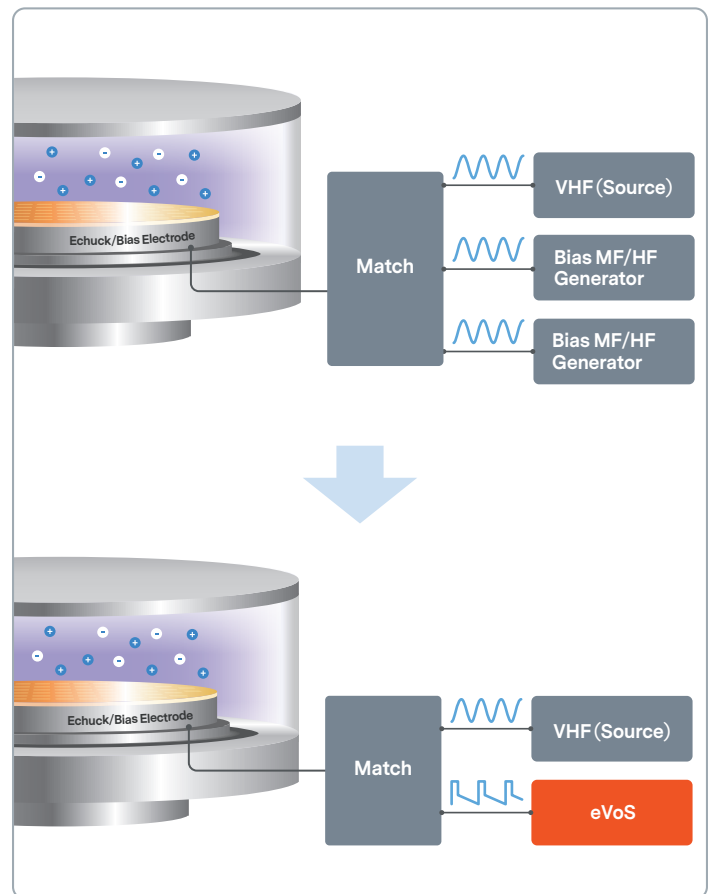
- Power levels
- Number of frequencies
- Requirements for synchronization

In comparison, eVoS technology enables a more streamlined, controlled bias design:

Typical Conductor Etch RF Bias Setup



Typical Dielectric Etch RF Bias Setup



eVoS™ ASYMMETRIC BIAS WAVEFORM GENERATOR



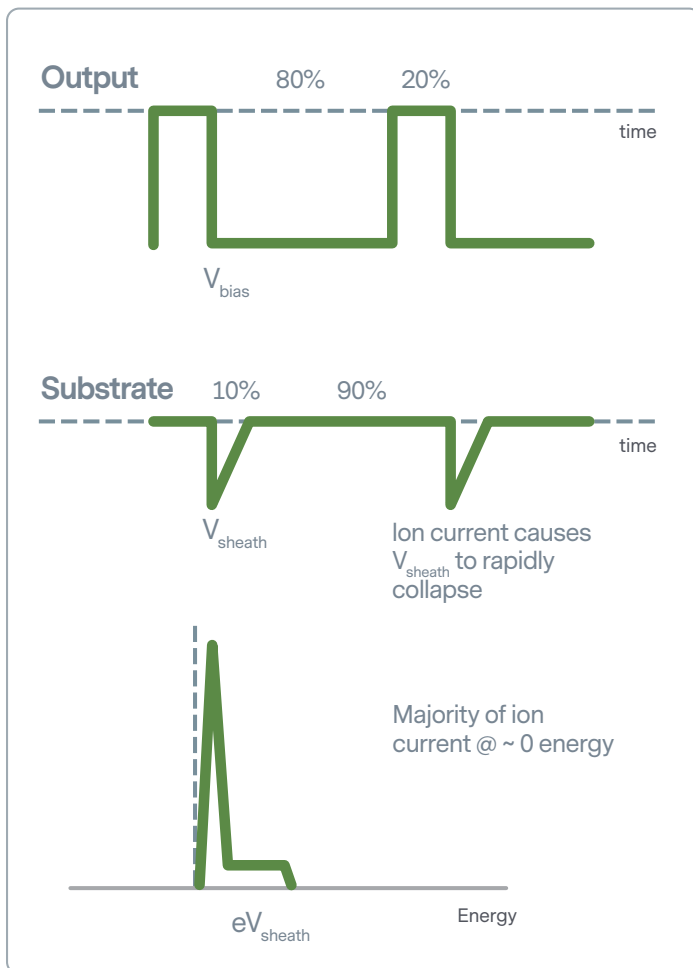


Beyond Pulsed DC: Optimized Waveform

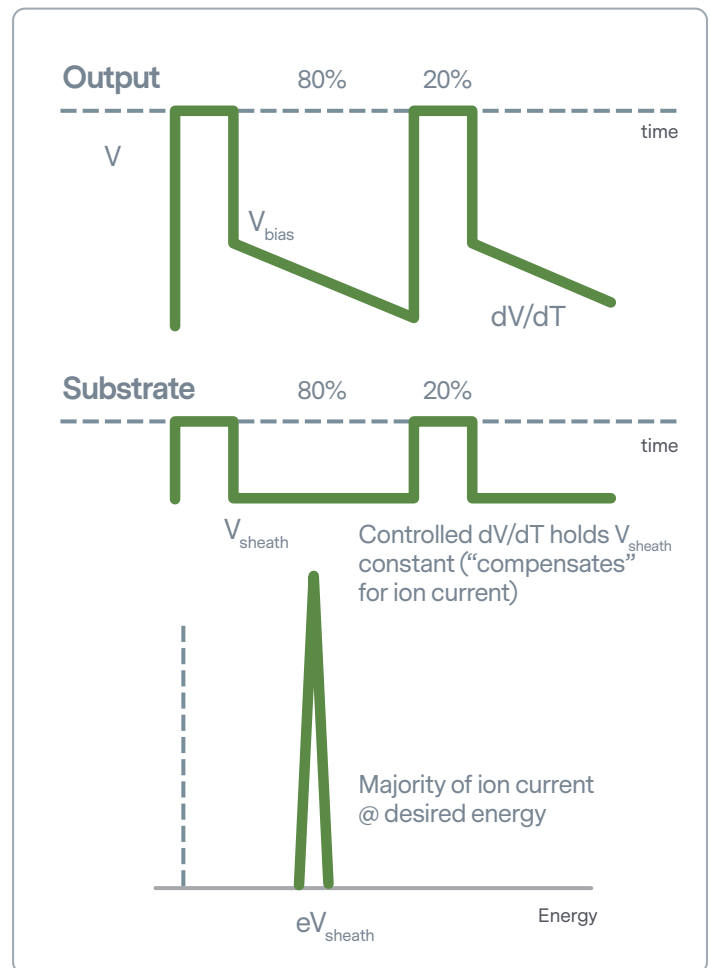
Patented switchmode bias and control:

- Periodically resets surface charge by positive voltage reversals
- Establishes user-defined bias voltage
- Holds substrate voltage constant (enabled by controlled dV/dT from the power supply) to achieve desired ion energy distribution

Pulsed-DC Waveform



eVoS Waveform



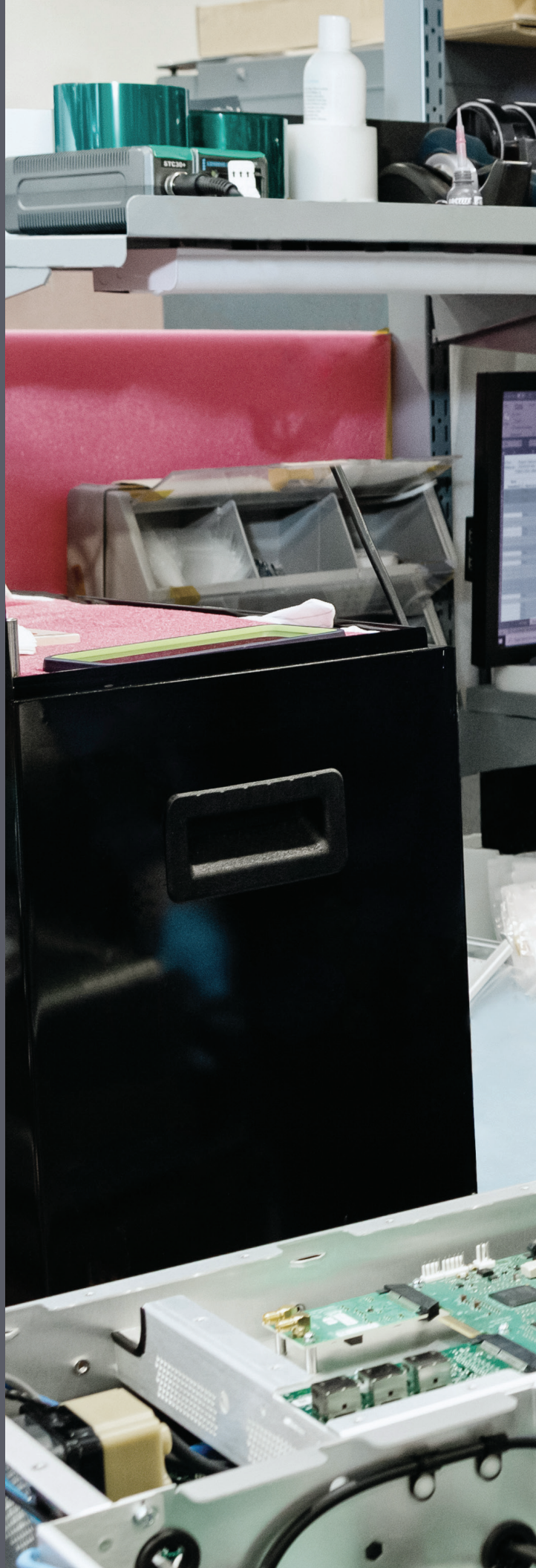
WORLDWIDE PRODUCT AND APPLICATION SUPPORT

AE field service engineers support your on-site needs, including installation, commissioning, set up, inspection, and more.

AE field applications engineers conduct on-site reviews and consultations to solve challenges and enhance process efficiency and productivity.

AE service centers are located around the world and provide the highest quality repairs to maximize uptime and reduce total cost of ownership.

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ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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