Advanced Energy

PARAMOUNT® HF
RF POWER-DELIVERY SYSTEMS

ADVANCED PROCESS DEVELOPMENT | 13.56 MHZ | 1.5 TO 6 KW



Paramount® HF
RF Power-Delivery Systems

With full digital control and dynamic response to plasma changes, the Paramount® platform keeps you at the leading edge of process innovation. As manufacturing technologies evolve, it delivers precise RF control to enable rapid plasma changes, while its flexible digital architecture, wide output coverage, and comprehensive feature set facilitate process customization.

BENEFITS

- Plasma stability and process repeatability
- Precise RF control
- Fast response to plasma changes
- Flexibility and adaptibility to meet specific application needs

SEMICONDUCTOR APPLICATIONS

- Conductor and dielectric etch
- PVD
- PECVD

FEATURES

- 1.5 to 6 kW, 13 MHz models
- Full digital control
- Pulsing and pulse synchronization
- Frequency tuning
- Real-time power and impedance measurement
- Tightly regulated output power
- Set points as low as 5 W
- Arc management
- Phase synchronization (CEX)



Digital Architecture

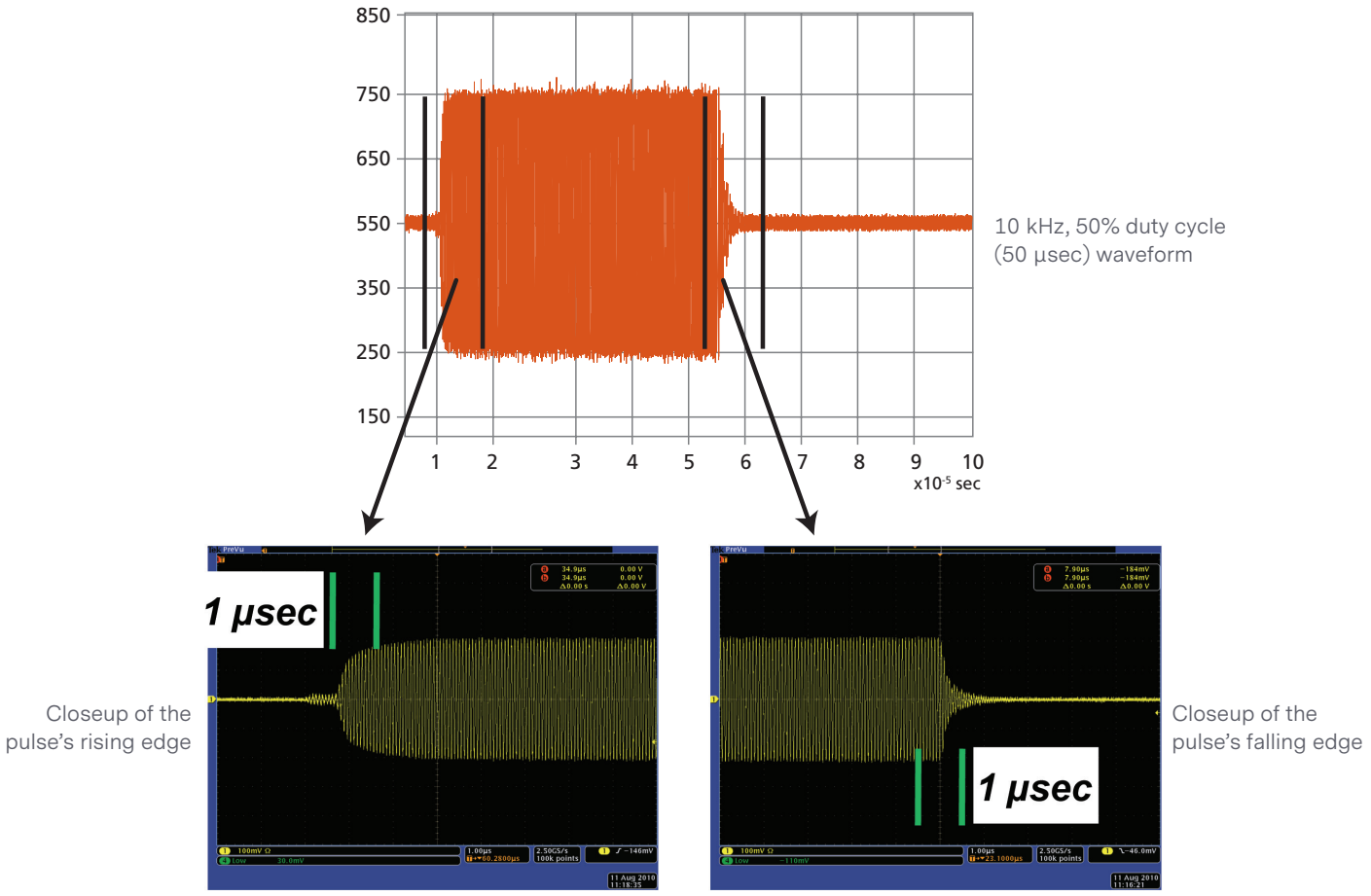
An inherently adaptable design enables precise process measurement and control, as well as easy integration of advanced functions — eliminating the complexity and lead times typically associated with hardware changes.

Wide Power Coverage

A wide set point range, from 5 to 6000 W, accommodates changing RF requirements, making process development more efficient by eliminating the need for new-product integrations and learning curves.

Pulsing

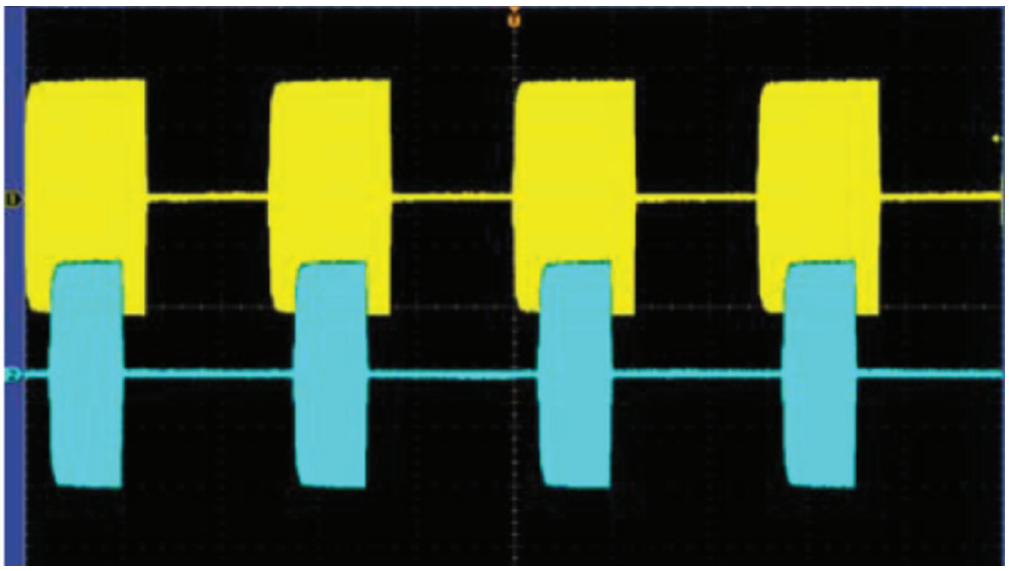
The RF pulsing performance of the Paramount HF power supply reduces charge buildup, arcing, and feature distortion during etching.



Example of pulsed-RF waveform into a 50 Ω resistive load

Pulse Synchronization

Synchronized pulsing for multiple Paramount HF units allows timing offset and varying pulse on-times.

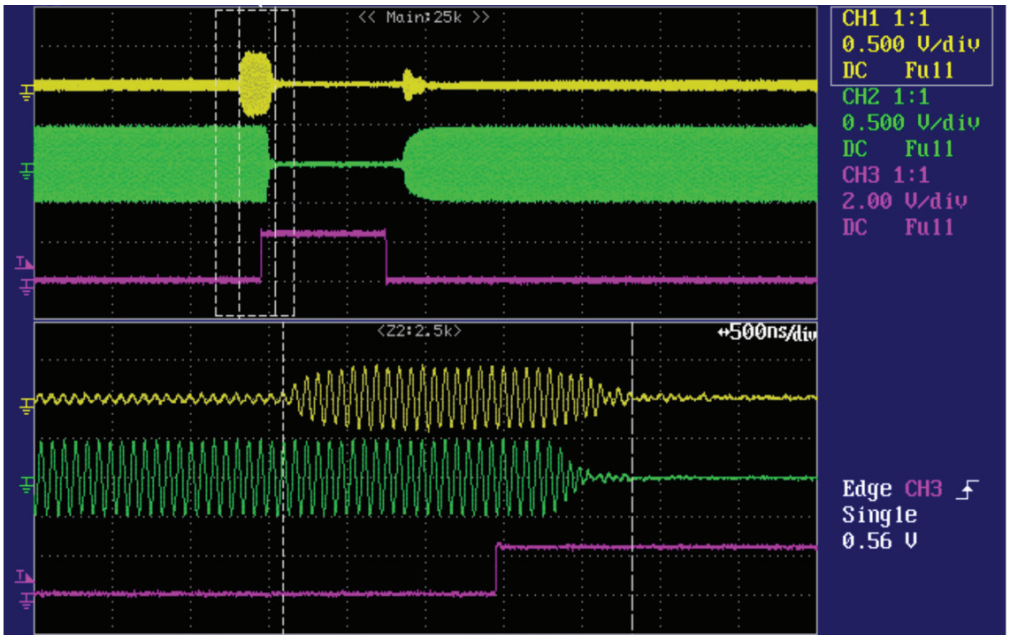


Main Unit

Satellite Unit

Arc Management

With user selectable arc-management parameters and a fast arc response, the Paramount HF platform helps reduce particle contamination, feature distortion, and equipment damage.

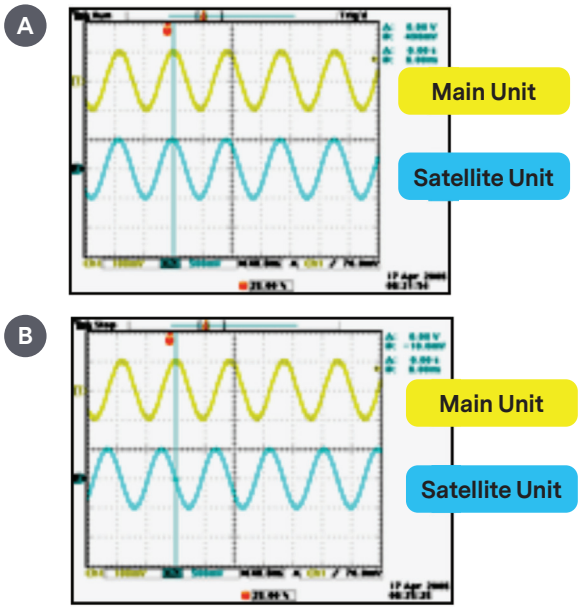


Sudden change in reflected power indicating an arc; rapid output power shutdown.

All arc management parameters are user-selectable.

Phase Synchronization (CEX)

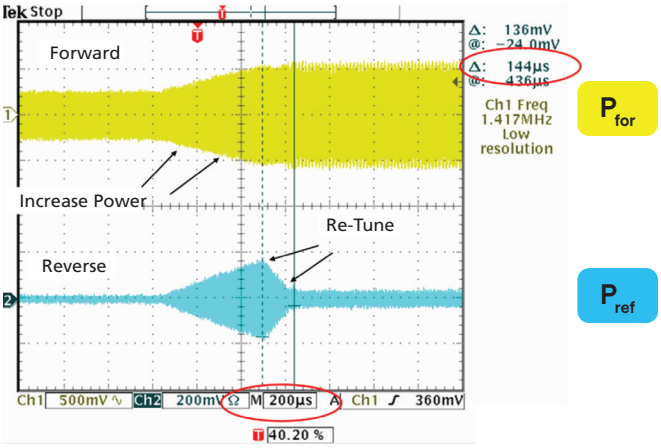
Synchronization of the output waveforms of connected Paramount HF units enables phase offset of multiple generators for process management.



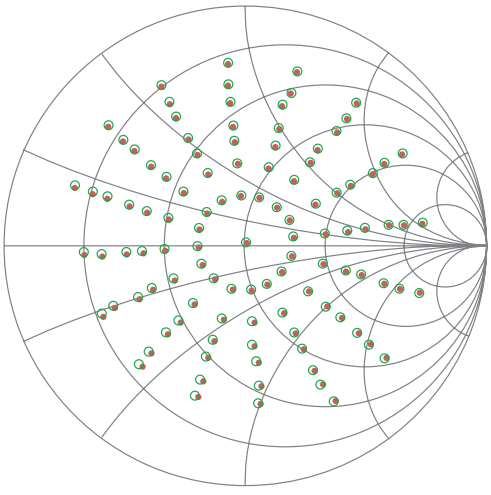
(a) 0° phase offset
(b) 90° offset
Phase offset is user-adjustable, 0 to 359°.

Frequency Tuning

During short process steps, fast tuning and repeatable power delivery maintain stability and repeatability.



Above, reflected power is minimized ~150 µsec after plasma power set point change.



Paramount® Power and Impedance Measurement Rivals the Accuracy of a Network Analyzer.

Advanced Power and Impendance Measurement

Real-time measurement of plasma characteristics and extreme sensitivity to plasma changes produce high-accuracy, repeatable power performance.

Paramount HF Power Supplies		
General Specifications		
RF Output Power	15 to 1500 W (HALO 5 to 1500 W)	
	30 to 3000 W (HALO 5 to 3000 W)	
	60 to 6000 W (HALO 5 to 6000 W)	
Regulation Modes	Forward power, load power, and VA regulation	
Minimum Step Resolution	1.0 W (0.1 W HALO)	
Repeatability (Same Generator)	±0.5%	
Repeatability (Unit to Unit)	< ±2% of set point, 50 Ω non-reactive loads	
Frequency	13.56 MHz ±0.005%	
Input Power	208 VAC ±10% (187 to 228 VAC)	
	400/480 VAC ±10% (360 to 528 VAC)	
Dimensions	1.5/3.0 kW	133 mm (H) x 216 mm (W) x 442 mm (D) 5.25" (H) x 8.5" (W) x 17.4" (D)
	6.0 kW	133 mm (H) x 483 mm (W) x 644 mm (D) 5.25" (H) x 19" (W) x 25.39" (D)
Weight	1.5/3.0 kW	< 16 kg (< 35 lb)
	6.0 kW	< 36.5 kg (< 80 lb)
Cooling Method	Combination air and water	
Efficiency	1.5/3.0 kW	> 68% at 3 kW into 50 Ω
	6.0 kW	> 65% at 6 kW into 50 Ω
Feature Set		
Pulsing	Available with pulse synchronization	
Continuous Wave (CW)	Available	
Single-Level Pulsing (SLP)	Frequency range: 2 Hz to 20 kHz	
Dual-Level Pulsing (DLP)	Frequency range: 2 Hz to 20 kHz	
Frequency Tuning	5% (12.882 to 14.238 MHz)	
Tune Time	< 100 ms, depending on user settings < 10 ms, typical	
Communication Protocols	RS-232, Ethernet℠, EtherCAT®, DeviceNet®	
Arc Management System	Available with arc synchronization	
Other Feature Sets	CEX, HALO	