



High Voltage Products. High Voltage Experts.



## **PARAMOUNT® PLUS PULSED-RF POWER SUPPLIES**

PREMIER PULSING TECHNOLOGY  
FOR EMERGING PLASMA APPLICATIONS  
400 KHZ TO 60 MHZ, 3 TO 15 KW





# Push the Boundaries of Innovation: **Powerful Plasma Control**

**With multi-level pulsing, pulse waveform control,** and the broadest feature set available in a pulsed-RF product, the Paramount® Plus platform allows you to push the boundaries of process innovation and delivers the best value in the marketplace. Excellent plasma stability, precise RF regulation, sophisticated pulse manipulation, and advanced data acquisition provide the extreme latitude in plasma control required for next-generation nodes.

- › Precise RF and pulse control
- › Enhanced plasma stability and process repeatability
- › Fast response to plasma changes
- › Flexibility and adaptability for advancing manufacturing technologies

## INCOMPARABLE VALUE

With a uniquely broad and powerful feature set, the Paramount® Plus power supply is the industry's most cost-effective solution. Based on the proven Paramount platform, it delivers performance repeatability and reliability you can bank on.

| FEATURES   | BENEFITS   | DELIVERED VALUE  |
|--|--|--|
| Full digital control                                 | Precise RF Control   | Real-time power control—even with the most abrupt plasma-impedance changes |
| Single- and dual-level pulsing                       | Enhanced plasma stability  | Faster plasma transitions  |
| Pulse synchronization                                | Flexibility and adaptability for advanced manufacturing technologies | Shorter process steps  |
| Pulse waveform control                               |  | Reduced process times  |
| Real-time power and impedance measurement            |  | Reduced film stress  |
| Real-time pulse monitoring                           |  | Improved film quality  |
| Advanced FastDAQ™ data acquisition system (optional) |  | Improved process repeatability and chamber matching                        |
| Frequency tuning                                     |  |  |
| Tightly regulated power output                       |  |  |
| Wide operating frequency range (400 kHz to 60 MHz)   |  |  |
| Wide power output range (3 to 15 kW)                 |  |  |
| High VSWR capability                                 |  |  |
| Best-in-class arc management                         |  |  |
| Phase synchronization (CEX)                          |  |  |
| Superior line sag immunity                           |  |  |

***Real-time power control—  
even with the most abrupt  
plasma-impedance changes***

## POWERFUL PULSE CONTROL FOR EMERGING APPLICATIONS

Sophisticated multi-level pulsing and pulse waveform control enable the pulse-shape repeatability into dynamic loads required for tomorrow's device geometries.

### MULTI-LEVEL PULSING

Two Power Set Point Levels Over Full Power Output Range

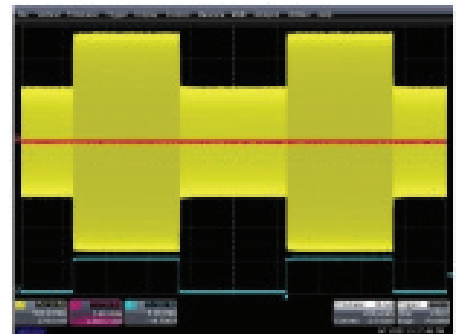
- › Plasma operation maintained during pulse low state, reducing impedance swing when pulse goes to high (source)
- › Ability to set two separate ion-energy peaks (bias)



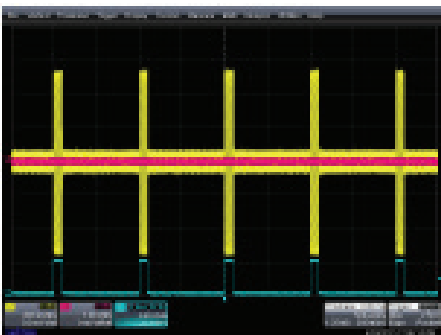
*Continuous Wave (CW)*



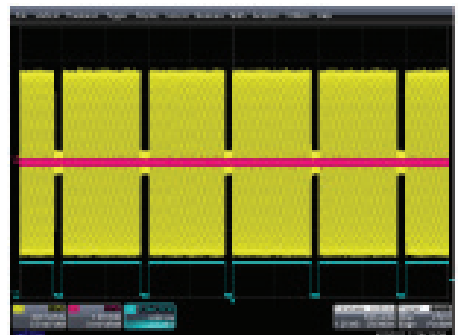
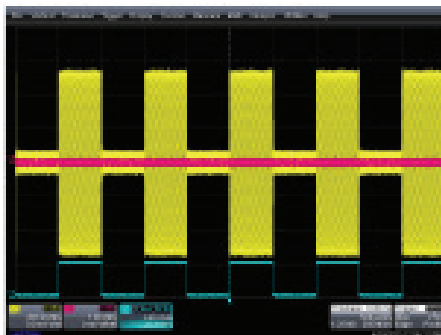
*Single-Level Pulsing*



*Dual-Level Pulsing*



*Low Duty Cycle*



*High Duty Cycle*

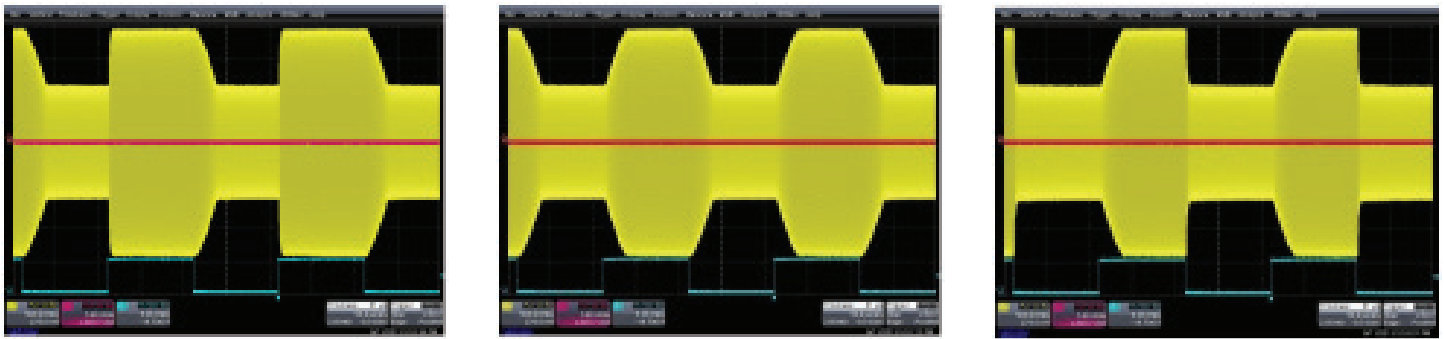
## PULSE WAVEFORM CONTROL

Precise, Repeatable Pulsing

- › Flat forward-power pulse waveform
- › Clean rise time
- › Limited over-shoot

Independent Control of Pulse Rise and Fall Times from ~1 to 25  $\mu\text{sec}$

- › Impact of sudden plasma impedance change minimized by reducing reflected power “spike” at pulse level change



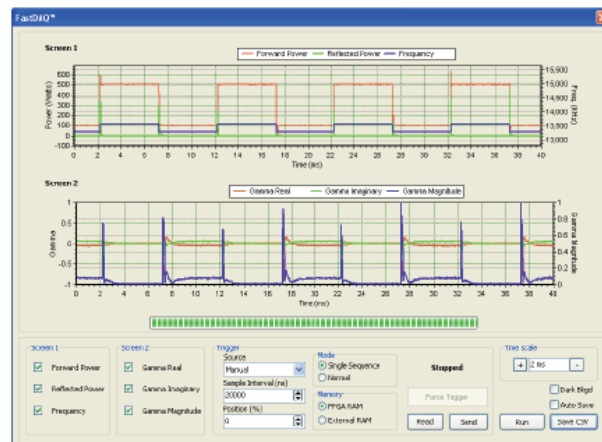
*Pulse Waveform Control*

## EXCEPTIONAL PROCESS INSIGHT

Real-time pulse monitoring and available FastDAQ™ data acquisition provide unique access to crucial parameters for advanced process development and system troubleshooting.

## FASTDAQ™ DATA ACQUISITION

- › Reduced need for directional coupler and oscilloscope
- › Monitoring via PC or .csv file download with Virtual Front Panel (VFP) interface



## GENERAL SPECIFICATIONS<sup>1</sup>

|   |   |
|---|---|
| <b>RF Power</b>                                   | 3 to 15 kW  |
| <b>Frequencies</b>                                | 400 kHz to 60 MHz   |
| <b>Power Accuracy into 50 <math>\Omega</math></b> | $\pm 1$ W or $\pm 1\%$ of set point, whichever is greater               |
| <b>Auto Frequency Tuning</b>                      | Available   |
| <b>Pulsing Frequency Range</b>                    | 5 Hz to 10 kHz  |
| <b>Available Serial Interfaces</b>                | RS-232, Ethernet, DeviceNet®, EtherCAT®, AE Navigator® II match control |

<sup>1</sup>Electrical specifications vary by model number. Please contact an AE representative for more information.



## PARAMOUNT® PLUS AND NAVIGATOR® II OPTIMIZED RF POWER-DELIVERY SYSTEM

Optimized to perform seamlessly with Paramount Plus power supplies, Navigator® II matching networks enable precise plasma process control, with tuning-while-pulsing over a wide pulse frequency and duty cycle range.

