

Led by experience. Driven by curiosity.

Synertia® RF Power Delivery Platform

The future of plasma control



c-met
pct



Synertia®

Comet's integrated RF Power Delivery Platform offers a new level of real-time data insight, which improves the stability of the plasma processes. It reduces downtime, boosts yield, and enhances productivity. Synertia® enables the user to manage the complexities of multi-layer next-generation and atomic-scale plasma processes integral to the production of memory and logic microchips.

13.56 MHz, 1.5 / 2.5 / 3.5 / 5.0 kW
27.12 MHz, 1.5 / 5.0 kW • 60 MHz, 2.5 / 5.0 kW

Synertia® RFG

Synertia® integrated RF Power Delivery Platform enables unprecedented control and precision for RF power delivery.

As semiconductor manufacturers extend device features from nanometer scale to angstrom and enable new 3D architectures to advance device performance and density, critical plasma processes like Etch and Deposition require more sophisticated RF power technology.

The Synertia RF Power Delivery Platform enables precise optimization at each process transition within continuous wave, pulsed, and multi-level pulsed waveforms to customize the plasma conditions for the best on-wafer results and provides class leading accuracy and repeatability to meet the needs of volume manufacturing for the next nodes and beyond.

The Synertia platform further enables greater synergy between the Generator and the Match Network with ultra- fast communication and coordination, strong capabilities for data capture and on-board analysis for actionable insights to enable more complex plasma applications than have ever been possible before: a new level of deep control.

Features

- Power accuracy (+/-1% of setpoint) across the entire power range
- Auto frequency tuning (+/-10% of nominal frequency)
- Precise pulse management: pulse duration, duty cycle, rising/falling slopes, etc.
- Single-level and multi-level pulsing
- Independent frequency tuning per level
- Multiple arc management detection methods
- Power efficiency >70%
- Cable length independence
- Digital metrology and intuitive graphical user interface
- Digital system control for advanced manufacturing technologies
- Wide range of interfaces and communication protocols

Benefits

- Ultra-fast plasma process control
- Consistent wafer level uniformity
- Rapid response to impedance changes
- Rapid reduction of reflected power in all operating modes including multi-level pulsing
- Arc detection working with close-loop power control to minimize wafer scrap
- Quick event analysis and fast troubleshooting
- Seamless integration into OEM tools



Synertia® RFG 15/13 and 50/13*

* Example data for 13 MHz generator.
Complete product overview on pct.comet.tech

Electrical specifications	RFG 15/13	RFG 50/13
Frequency	13.56 MHz +/- 10%	
Frequency stability and accuracy	± 50 ppm	
Output power	1.5 W to 1500 W	5 W to 5000 W
RF accuracy into 50 Ω	± 1 % of setpoint or ± 0.3 W whichever is greater	± 1 % of setpoint or ± 1 W whichever is greater
Spurious and harmonics		
Harmonics into 50 Ω	– 40 dBc	
Spurious into 50 Ω	– 50 dBc	
RF pulsing		
Pulse rate	0.05 Hz to 100 kHz	
Pulse rise/fall time	320/240 ns	650/240 ns
Multi-level pulsing	up to 4 individual levels	
Options		
CEX	400 kHz to 110 MHz	
Frequency tuning	within ± 10 % of nominal frequency	
Arc management	various detection and suppression options	
Interfaces	EtherCAT®, RS232, RS-485, EtherNET®, and various Analog and Digital I/Os	
Power rating and coolant requirements		
AC input	208 to 240 VAC, 1~, ±10 % tolerant	200 to 480 VAC, 3~, ±10 % tolerant
AC _{eff} to RF efficiency	typically 73 %	
Ambient temperature	+5 °C to +35 °C	+5 °C to +40 °C
Cooling system	Forced air	Water-cooled
Mechanical specifications		
Form factor	3U, 19" half-rack	
Dimensions excl. connectors (w x h x d)	216 x 129 x 461 mm 8.5" x 5.08" x 18.15"	216 x 129 x 608 mm 8.5" x 5.08" x 24.0"
Weight	< 14 kg / < 31 lb	< 24 kg / < 53 lb
RF output connector types	N, 7-16, HN, LC	
Certification		
Compliance directives and industrial standards CE	2014 / 35 / EU low voltage directive	
	2014 / 30 / EU EMC directive	
	RoHS 2011/65/EU and 2015/863/EU	
	EN 55011, EN 61000-3-2 (RFG 15/13),	
	EN 61000-3-3, EN 61000-6-2, EN 61010-1, EN 61326-1, SEMI S2, S8, S14, S22, F47, ISTA 1G, ISTA 3A	

Comet products may be protected by patents in the United States and other countries. For detailed information please consult our website pct.comet.tech/patents

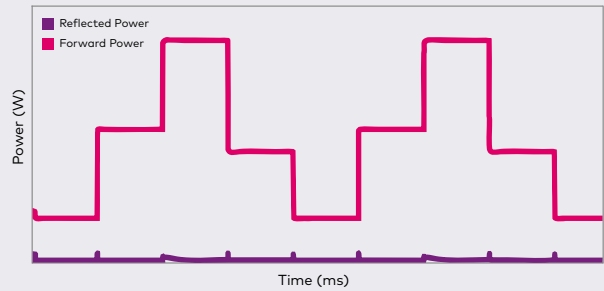
RF Power Accuracy

Highly accurate power delivery within ± 10 % of nominal frequency



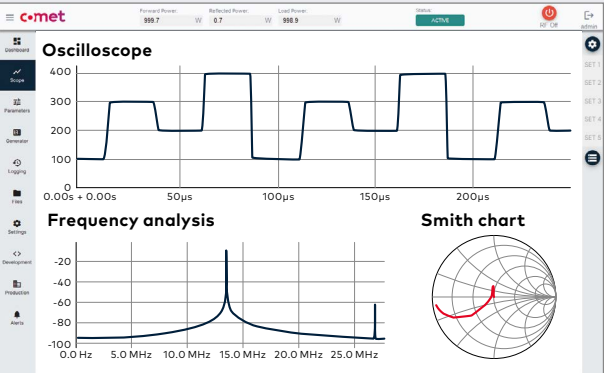
Multi-Level Pulse

Rapid response to impedance changes enable effective power delivery



Integrated measurement studio

- Advanced oscilloscope functions for direct access to crucial process parameters
- Event based trigger and data logging functionality



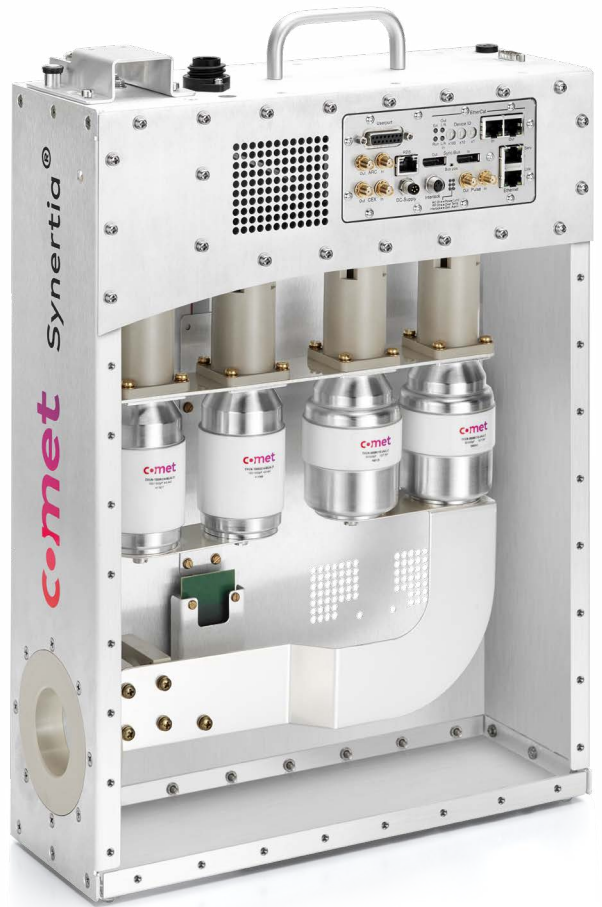
All measurements were performed into non-reactive load at center frequency and nominal power using maximum AC voltage in laboratory environment unless otherwise stated.

Impedance Matching Networks

Synertia® RFM

As semiconductor manufacturers extend device features from nanometer scale to angstrom and enable new 3D architectures to advance device performance and density, critical plasma processes require more sophisticated and accurate control of RF power delivery.

Synertia® provides unparalleled impedance matching for complex pulsing profiles and multiple pulse states enabling customization of the plasma conditions to achieve best on-wafer results while providing leading class accuracy and repeatability.



With its strong capabilities for data capture and on-board analysis for actionable insights, Synertia RF matching network enables more complex plasma applications than have ever been possible before: a new level of RF control.

Features

- Advanced tuning algorithms for improved tuning speeds and process control
- Advanced customer-accessible metrology data
- Wide-band V/I sensors with high fidelity and sensitivity
- Track and tune when RF fundamental frequency is varied up to $\pm 10\%$
- Powerful programmable logic for signal processing and data collection
- On-board monitoring and diagnostics functions
- Standard and customized capacitor designs
- Intuitive graphical user interface

Benefits

- Ultra-fast, consistent, stable plasma control
- Superior process control and repeatability with fully digital and customizable controls
- Continuous process improvement via real time signal processing and data collection
- Accelerate process development by quick event analysis and post-analyze incidents

Technical data Synertia® RFM

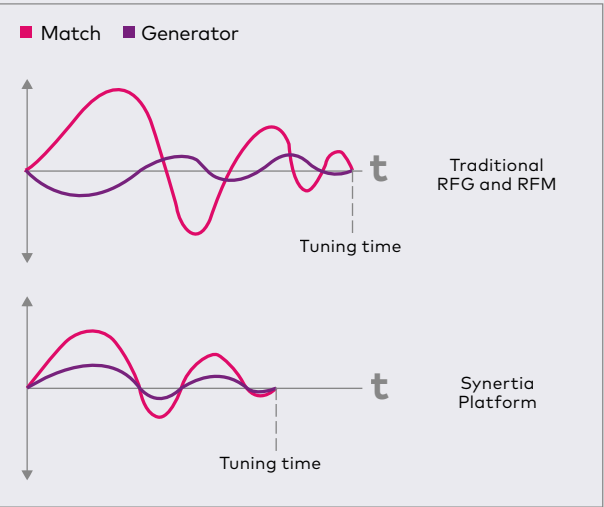
Electrical specifications	
Match types	Single frequency Dual frequency
Available matching topologies	L, T, and Pi match
Frequency range	400 kHz – 60 MHz
Output V/I	max. current ($\sim 150 A_{PEAK}$) max. voltage ($10 kV_{PEAK}$)
Input power	up to 15 kW
Communication interface	EtherCAT®, RS232, analog, Ethernet
Pulsing	Single, dual and multi-level
Pulsing state time	5 μ sec to 1 second
Pulsing capability	0.5 Hz to 100 kHz
External pulse sync	TTL
Advanced features	$\pm 10\%$ frequency range
Optional sensors	Vpp, Vdc and others
Input voltage	24 VDC
Tune time	< 500 msec depending on pre-set points
Tuning range	Depends on unit frequency and on the tuning coil installed

Mechanical specifications	
Dimensions	Designed per customer's requirements
Weight	
Cooling	Air
RF input connector	Designed per customer's requirements
RF output connector	Various including 7-16, HN, LC, N
DC power input connector	
Primary output connector	Designed per customer's requirements
Interlock requirement	Standard feature
Certification	
Compliance	Semi S2

Synertia® is a registered trademark of Comet AG.
Specifications are subject to change without notice.
Comet can not be made responsible for errors or omissions.

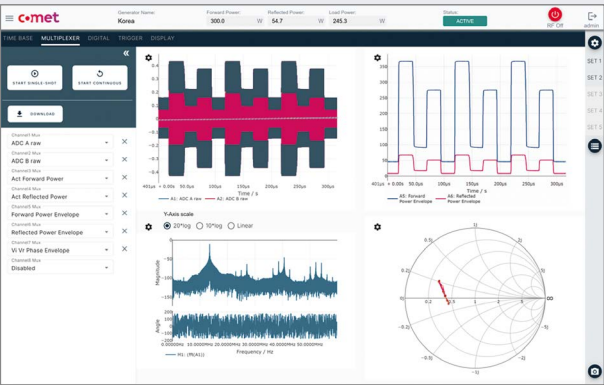
Comet Matching Networks

Improved RFM Tuning time



Integrated measurement studio

- Advanced oscilloscope functions for direct access to crucial process parameters
- Event based trigger and data logging functionality



Vertically integrated



Comet is the only supplier that designs and builds every critical component, from capacitor to matching networks and RF generators

Cutting edge features and full customer orientation

Smart and powerful control of plasma conditions at highest speed: highly synergized RF power delivery subsystems control atomic scale plasma processes and accelerate performance.

Synertia® includes a comprehensive development, testing and qualification infrastructure unmatched in its commitment to customer support.

Ultra-fast response

Synertia® enables real-time insights into plasma processes at a new level. Critical problems and challenges are solved faster leading to significant time and money savings and a faster time to market for new products.

Integrated advanced functionalities

The Auto Frequency Tuning (AFT) algorithm allows to quickly adapt to the plasma process, and arc management helps mitigate wafer damage and boost productivity. Additionally, the integrated measurement studio saves money in lab equipment, and applications like the advanced oscilloscope functions allow direct access to crucial process parameters. The integrated measurement suite is a toolbox for advanced users to visualize process performance issues and diagnose in a shorter time period.

Co-optimized RF power source

RF systems can achieve optimal performance only if the RF power generator and corresponding matching network are optimally synchronized and communicating in real time.

Worldwide teams

Specialists in high-frequency technology, embedded software, material science, digitalization and more ensure Comet customers get the best and immediate R&D support.

Modern environment

Comet's high-power RF smartLABs form a world-wide interlinked lab environment for prototyping, in-the-loop testing, and automated data-driven design verification. This allows for faster qualification of new functions and provides the possibility of duplicating/analyzing field problems extremely fast.

Digital tool & process chain

Digitalized processes enhance the collaboration between the global Comet team and customers worldwide. This enables more complex and sustainable solutions that are fully traceable and transparent.

Progressive technology

The signal processing and data streaming capabilities of Synertia® offer a new level of process and yield optimization. More than 1000 parameters are monitored and analyzed.

Providing solutions near you

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