



## DC Pulsing Products

Proven benefits for  
reactive and conductive  
DC sputtering

## Benefits

Increase throughput by permitting operation at higher powers

Reduce target contamination, allowing wider process latitude

Improve deposition and yield rates in reactive and metal processes

Increase deposition time by reducing or eliminating arcing

Improve uniformity—by 50% in many reactive processes

Improve film properties—making denser, tougher, brighter, and more transparent films

Significantly reduce particle contamination

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## Features

Superior arc control—in many cases arcs are completely eliminated

Higher ion energy

Higher power operation

Lower substrate temperature

Lower target temperature

Process flexibility and latitude

Easy system integration

Dual-cathode capability (Astral® products)

*Since the 1980s, AE has worked to provide pulsing solutions for process problems. AE's pulsed-DC products have improved our customers' process quality, uniformity, and throughput for both reactive and metallic processes where straight DC sputtering is inadequate.*

*Among the many benefits of pulsed DC, the most significant is the ability to clear charges to prevent arcing.\* AE pulsing products periodically reverse electrode voltage, clearing the buildup of charges by attracting the opposite charge during the pulse.*

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**Pulsing products can increase sputtering quality and enable longer process run times in these applications:**

<i>ITO</i>	<i>ZrO<sub>2</sub></i>	<i>TiW</i>	<i>Al<sub>2</sub>O<sub>3</sub></i>
<i>ZnO</i>	<i>TiO<sub>2</sub></i>	<i>SiO<sub>2</sub></i>	<i>TiO<sub>2</sub></i>
<i>Si<sub>3</sub>N<sub>4</sub></i>	<i>SiN</i>	<i>TiN</i>	<i>Cr</i>
<i>Cr<sub>2</sub>O<sub>3</sub></i>	<i>SnO<sub>2</sub></i>	<i>Ta<sub>2</sub>O<sub>5</sub></i>	

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AE's family of pulsing products covers a spectrum of capabilities to meet all of your difficult and varying process requirements. This flexible collection of DC pulsing accessories provides power from 10 to 480 kW as well as fixed and variable frequencies from 2 to 100 kHz. Each member of this family is designed with features that deliver process benefits.

### **Pulsar™ 40 kW, 100 A, Single-Output Pulsing Product**

This Pulsar™ model is a member of AE's newest generation of DC pulsing accessories, which is optimized for insulative dielectric film deposition using a reactive sputtering process. This model delivers 0 to 20 kHz frequencies with up to 40 kW of power. It is designed to accept a high current of up to 100 A per unit for a single-cathode configuration.

\*Covered under U.S. Patents No. 5,427,669; No. 5,576,939; No. 5,718,813; No. 5,863,392; No. 6,001,224; and No. 6,024,844

## Pulsar™ 40/40 kW, 100 A, Dual-Output Pulsing Product

This Pulsar model provides the same pulsed DC as the Pulsar 40 kW model (0 to 20 kHz with up to 40 kW), but is capable of handling 40 kW of DC power at a high current of 100 A per side in a dual output to independent cathodes. As with other members of the Pulsar product family, it is optimized for insulative dielectric film deposition using a reactive sputtering process.

## Pulsar™ 80 kW, 200 A, Single-Output Pulsing Product

This Pulsar model offers up to 80 kW of DC power (0 to 20 kHz) per unit for a single-cathode configuration. It is designed to accept up to 200 A of current for a single-cathode configuration. As with other members of the Pulsar family, it is optimized for reactive sputtering processes used to deposit insulative dielectric films. This unit can be m/s to 480 kW.

## Sparc® and Sparc-le® 20 Pulsing Products

The Sparc® model provides a fixed 2 kHz frequency with up to 30 kW. The Sparc-le® 20 model delivers 10 kW, but at higher fixed frequencies of 2 to 20 kHz. These cost-effective units are ideal for less difficult, less insulative processes such as  $\text{Si}_3\text{N}_4$  and ITO.

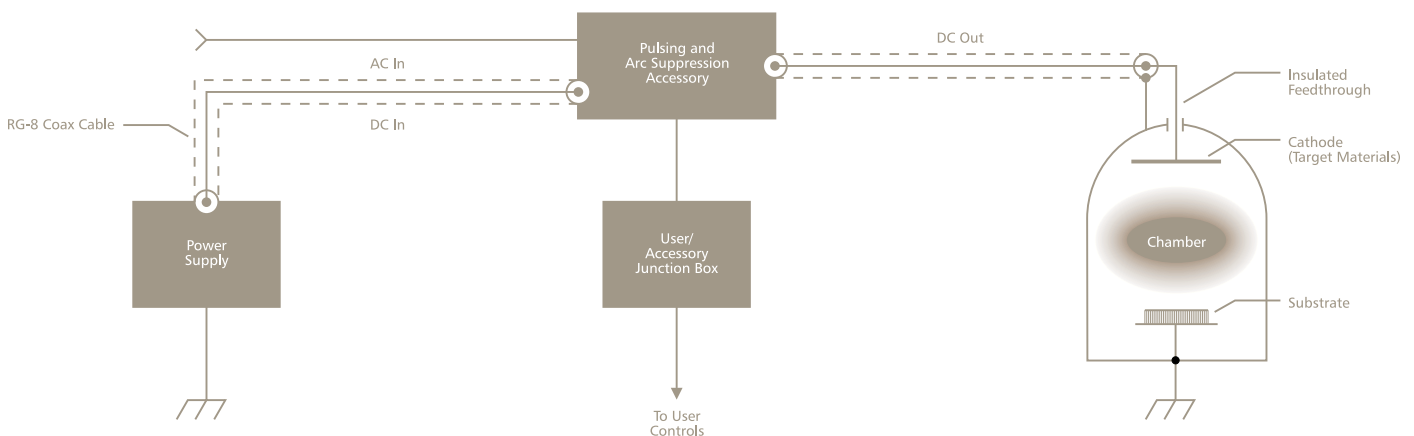
## Sparc-le® V Pulsing Products

The versatile Sparc-le V model offers variable frequencies of up to 100 kHz as well as a variable duty cycle and reverse voltage capability. This model is especially suited for process development with highly reactive applications such as  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$ , where higher frequencies benefit the process.

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For an integrated power supply and pulsing solution, Advanced Energy offers a Pinnacle® Plus+ pulsed-DC power supply in a single, compact package that offers unmatched ease of use in addition to wide flexibility. For more information, contact your sales representative or visit AE's website ([www.advanced-energy.com](http://www.advanced-energy.com)).

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Easy system integration

## Electrical Specifications

	Sparc® Product	Sparc-le® 20 Product	Sparc-le® V Product	Pulsar™ Product
Maximum Output Power	30 kW	10 kW	12 kW	40 and 80 kW
Pulse Frequency	2 kHz	20 kHz	1 to 5 and 20 to 100 kHz	2 to 20 kHz
Reverse/Off Time (Min/Max)	10 μs	5 μs	1 to 10 μs	5 to 22.5 μs
Arc Level (of Input Voltage)	~50%			25 to 400 VDC
Operating Voltage (Average)	150 to 1000 VDC			0 to 1030 VDC
Strike Voltage Capability	1800 VDC			1600 VDC
Operating Current (Max)	75 to 100 A	25 A	30 A	100 or 200 A
Interfaces	PLC		PLC, RS-232, RS-422, RS-485	
Reverse Recovery Voltage	10%		10%, 15%, 20%	10%
Input AC Line Voltage	120/230 VAC, 50/60 Hz			90 to 264 VAC, 50/60 Hz

## Physical Specifications

	Sparc® Product	Sparc-le® 20 Product	Sparc-le® V Product	Pulsar™ Product
Size	178 mm (H) x 483 mm (W) x 368 mm (D)	133 mm (H) x 483 mm (W) x 194 mm (D)	133 mm (H) x 483 mm (W) x 422 mm (D)	557 mm (H) x 508 mm (W) x 738 mm (D)
	7" (H) x 19" (W) x 14.5" (D)	5.25" (H) x 19" (W) x 7.65" (D)	5.25" (H) x 19" (W) x 16.6" (D)	21.92" (H) x 20" (W) x 29.05" (D)
Weight	21.4 kg (47 lb)	7.7 kg (17 lb)	17.3 kg (38 lb)	127 kg (280 lb)
Air Cooling Requirements	0 to 35°C (32 to 95°F)			0 to 40°C (32 to 104°F)
Display Type	Status LEDs		LEDs and 4-digit display	Active, front panel
I/O Connector for DC	UHF, female (83-1R)		UHF, female or 3-pin pluggable	M10 ring lug
User (Analog) Port Connector	9-pin, sub-miniature D, male		25-pin, sub-miniature D, female	37-pin, sub-miniature D, male
Serial Port Connector	N/A		9-pin, sub-miniature D, female	9-pin, sub-miniature D, female
Master/Slave	N/A		Yes	Up to 6 units
CEX	No		Yes	Yes

