

**ARC CONTROL AND SWITCHING ELEMENT PROTECTION FOR PULSED
DC POWER SUPPLY*****Abstract***

A dc sputtering process applies a pulsating dc voltage in which each cycle includes a pulse portion of negative dc voltage of -300 to -700 volts alternating with a reverse bias (positive) pulse of about +50 to +300 volts. The reverse bias pulse portion will reduce or eliminate sources for arcing in most cases. To combat sticky or persistent arcing, the negative pulse portion is monitored. If, during a window portion of the negative pulse portion, a mechanical arcing detector (30) senses that the applied voltage has fallen into a range characteristic of arcing for two successive cycles, then the applied power is interrupted for a period, e.g., 200 microseconds, and reverse bias is applied. An overvoltage detection and clamping circuit (36) monitors the applied voltage for extreme voltage excursions, and if an overvoltage threshold is exceeded for two successive cycles, the applied power is interrupted. The overvoltage detection and clamping circuit can comprise a string of zener diodes (38) or equivalent voltage limiting devices connected to the applied voltage. This circuit (36) absorbs the voltage excursions beyond the threshold and protects the power supply and the substrate in the plasma chamber.

FIG. 1