

Watlow's New POWERGLIDE® Enables Superior Performance of Multiple Zone Aluminum Nitride Ceramic Pedestals

POWERGLIDE® is a unique embodiment of Watlow's Adaptive Thermal Systems (ATS™) technology and combines temperature and power control into one ATS-enabled device ideal for semiconductor processing applications.

The process activities in a semiconductor chamber can cause the inner and outer zones of a two-zone aluminum nitride ceramic pedestal to change temperature, sometimes in different directions. Open loop or power ratio control is the current method of determining how much power to deliver to the outer zone based on the power of the inner zone, since there is typically no sensor in the hard-to-access outer zone. This causes the outer zone to react in the same manner as the inner zone when the boundary conditions change due to gas introduction, pedestal repositioning, plasma application or wafer placement. This parallel action might be opposite of what is needed to maintain proper temperature uniformity. This can cause significant temperature difference in the inner and outer zones resulting in poor thermal uniformity and reduction in yield. In addition, when the temperature delta between the zones becomes too large cracked pedestals and broken wafers are typical non-desired results.

Watlow's solution... POWERGLIDE, enabled with ATS technology, a next generation controller.

Watlow's new POWERGLIDE enables certain two-zone aluminum nitride ceramic pedestals to perform more efficiently. It runs closed loop and monitors temperature from both zones to improve uniformity, help prevent ceramic breakage, achieve higher temperatures and provide visibility to changing conditions.

With POWERGLIDE, users will gain total control of power quality. POWERGLIDE features Watlow's innovative ATS technology and incorporates power conversion, a technology platform that regulates power up and down



rather than on and off. In addition, POWERGLIDE incorporates an algorithm that uses temperature co-efficient of resistance (TCR) to measure temperature and provide control, which is a technology platform that converts every heater zone into a sensor, as well as ceramic protection algorithms.

POWERGLIDE offers several communication protocols including EtherCAT®, which is optimized for the semiconductor manufacturing industry.

Features and Benefits

- > **Built-in automatic calibration algorithm**
 - Eliminates downtime associated with calibration
- > **High TCR heater materials based temperature control**
 - Allows closed loop control for all zones
- > **Incorporates ceramic control algorithms**
 - Maintains the limitations of the materials to protect the pedestal
 - Provides programmable, state-based PID control
- > **EtherCAT® communications protocol**
 - Ensures adherence to industry standard protocols

Specifications

Environmental

- Operating temperature: 0 to 50°C
- Humidity: 5% to 95% RH non-condensing

Physical

- Dimensions: 9.0 in. L x 5.5 in. W x 4.0 in. T
- Weight: 6.15 lbs including heat sink
- Mounting: can be paired with a second unit to share heat sink fan, 4 #8 screws to a back plate

Power Outputs

- Quantity: two, 1 per zone pedestal
- Output voltage: 0-208V rectified AC
- Output current: 30A (peak), 25A steady state max.
- Interlock relay: one, form A - 5A, 24V

Power Input

- Quantity: 2, 1 per zone, each zone isolated from the other
- Input voltage: 85 to 264VAC/DC

Electronics (Logic) Power

- 24VDC on DB9

Communications

- RS-485 on pair of DB9 with pass-through, Watlow standard bus protocol
- EtherCAT® supporting ETG.5003.2060
- USB device 2.0, Watlow standard bus protocol

Sensing Inputs

- 2 zones of thermocouple Type K for reference sensing
- Heater resistance 1 to 30 ohms via delivered I and V resolution 0.001Ω
- Heater measurement accuracy 0.01 ohms

Algorithms

- Inner and outer set points via two separate, independent control loops
- Control PV sources: Heater filament temperature via Resistance, Reference TC, Wafer TC, chamber compensated filament temperature; can be changed while running
- Model based PID and rate control with 8 programmable control states
 - Power-up
 - Soft start
 - Rate control
 - PID control
 - Manual power
 - Remote power
 - Off
- 2 programmable transition conditions per state

Pedestal Protection Algorithms

- Zone to zone temperature difference reduction and safety shutdown
- Zone to reference temperature difference reduction and safety shutdown
- Over-temp shutdown
- Drives interlock relay
- Over-current shutdown
- Shorted output protection

Resistance to Temperature Methods

- Programmable base resistance and TCR
- 16 point offset table
- Auto-calibration to reference TC wafer (patent pending)

Agency Directive

- UL®/EN 61010-1 Safety Requirements for measurement, control and laboratory equipment

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EtherCAT® is a registered trademark of Beckhoff Automation GmbH.

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