BCE APPLICATION NOTE

ELECTRIC HEATING ELEMENTS

VACUUM FEEDTHROUGHS

CUSTOM THERMAL SYSTEMS

CERAMICS ENGINEERING

LASER DRILLING AND ETCHING

BCE's VACUUM RING HEATER: DEFYING BOUNDARIES IN DEGASSING CHAMBERS

Providing uniform heat to semiconductor devices in degassing chambers is essential in extracting impurities. This can only be achieved if a heating device has the proper fit and temperature uniformity for a given chamber. It is for this very application that BCE was approached by a large semiconductor company from Silicon Valley. In order to heat this company's semiconductor wafers, it was critical that the heating device be manufactured to fit precisely into a large and circular degassing chamber posing manufacturing challenges due to dimensional and application parameters. BCE was able to provide extensive design consultations, 3D CAD modeling and lean manufacturing capabilities to this semiconductor giant at a competitive price. All these services were rendered while catering to all requirements needed to successfully manufacture their products.

SCOPE

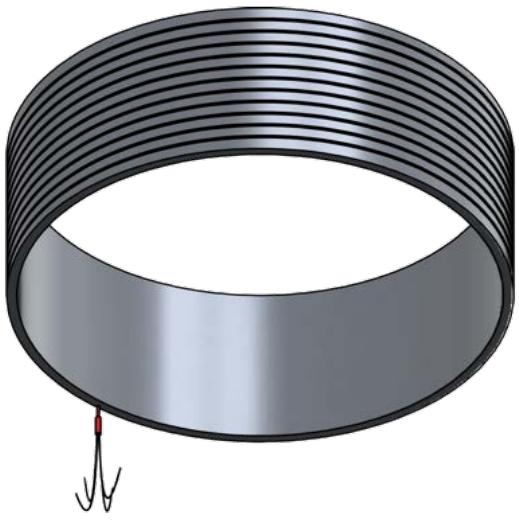
The heating apparatus needed to satisfy the following criteria:

- Vacuum compatibility to 10^{-8} Torr.
- Maximum Operating Temperature: 200°C.
- Temperature uniformity of ±4% at 150°C
- Operate at 1500W, 240V.
- All epoxies used needed to meet NASA's Low Outgassing Spec (ASTM E595).
- Reduced contamination from components inside chamber.
- Temperature sensing capability.
- Circular configuration between 34 and 36 inches in diameter.
- Height of part was not to exceed 1 ft.
- Effective heat transfer from heating device with reduced machining cost.

OUTCOME:

BCE's Vacuum Ring Heater proved to be the ideal product for this application. Its strong aluminum ring construction ensured effective heat transfer to the circular wafers while keeping manufacturing costs low. Furthermore, its strategically embedded heater with stainless steel sheath allowed the device's temperature uniformity to remain at ±2% at 150°C, greatly exceeding customer requirements. Moreover, BCE's proprietary epoxy meeting NASA's low outgassing spec was used as the primary sealant and KAPTON insulated leads were provided for the heater and integrated thermocouple to reduce contamination. In fact, the integrated thermocouple type K further served to monitor the temperature supplied to the chamber. Finally, all electrical, vacuum and dimensional requirements were met to provide the most optimal thermal environment.

For the detailed drawing, click here.



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