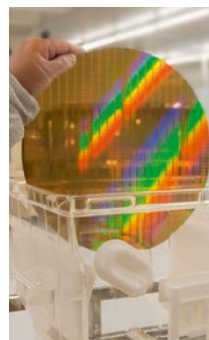


## APPLICATION INFORMATION

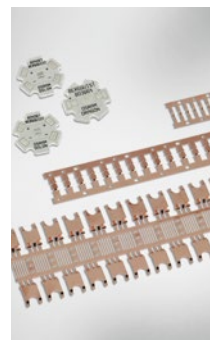
# Openair-Plasma® in Semiconductor Manufacturing

Selective treatment and inline solutions with plasma technology

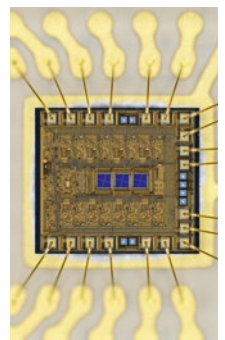
Vacuum plasma has been used for many applications in the semiconductor industry. In the Openair-Plasma® process, a "reactive plasma zone" integrated into the plasma unit makes it possible to carry out continuous pretreatment during the ongoing production process. The potential-free Openair-Plasma® microfine cleaning system is ideal for the production of highly sensitive electrical components, replacing the vacuum chamber in the production of chip packaging in a much more efficient and cost-effective way. The method ensures a fast inline process and guarantees perfect uniformity regardless of your process and product.



Front-End



Lead Frame



Back-End/Packaging

## Openair-Plasma® processes

### Cleaning

Openair-Plasma® reliably and effectively cleans and removes all organic and silicone-based contaminants as well as electrostatically attracted dust.

### Activating

Openair-Plasma® activates the surface. The result is a high surface energy (over 72 mN/m) and full wettability.

### Coating

Maximum protection to prevent epoxy bleed out, for example, or serves as corrosion protection for LED applications.

## Features

- Selective area treatment possible
- High-speed treatment: Up to 1.5 m/sec.
- Potential-free: <1V, can also be used on sensitive electronics
- Cost-effective: Low investment and operating costs
- Flexible: Adaptable to all surfaces (flat or 3D)
- Environmentally friendly: No solvents thanks to the use of compressed air, VOC free technology

## Electrically Potential-Free Openair-Plasma® Jet

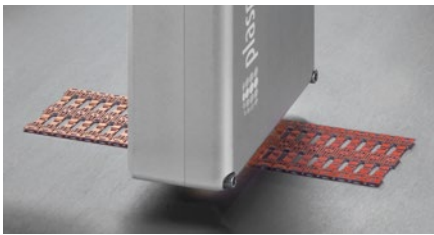
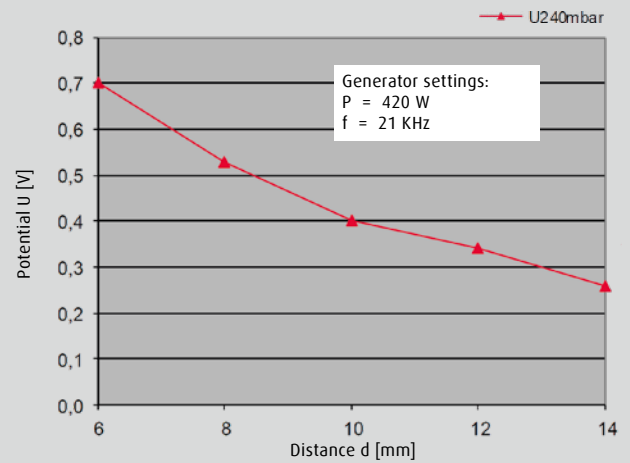


### PCU Ensures Process Stability

The PCU (Plasma Control Unit) ensures that all parameters are monitored and the plasma result is identical for each part treated.

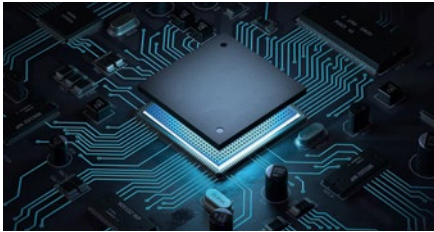
### Electronics Safe Technology

With the specially developed potential-free jets, the Openair-Plasma® technology is applied in electronic applications without damaging the electronics.



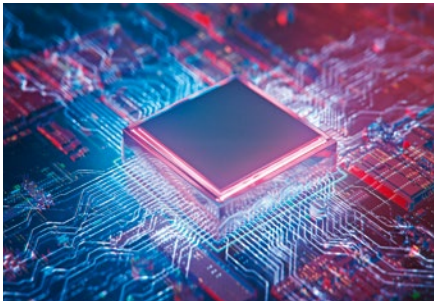
### Leadframe / Packaging

Until now, unwanted oxide layers could only be removed prior to soldering or bonding processes by means of vacuum plasma chamber technology in a time-consuming and costly process. Openair-Plasma® microfine cleaning replaces the vacuum chamber in the production of chip packaging. A "reactive plasma zone" integrated into the plasma unit makes it possible to carry out continuous pretreatment during the ongoing production process.



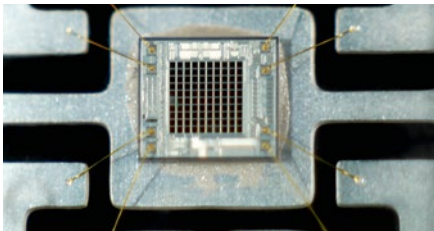
### Bonding

Openair-Plasma® cleans surfaces, thus ensuring improved adhesion of die bond material and of soft solder. The strengthened bond between die and substrate that results from this in turn has a positive effect on heat dissipation. The high surface energy ensures that dies adhere without cavities. In addition, the higher surface energy achieved by the Openair-Plasma® process allows soft solder to be applied 50% faster. The Openair-Plasma® jets can also be integrated into existing die bonders.



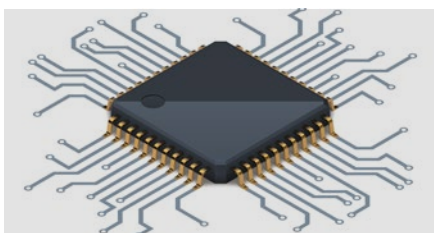
### Thermal Compress Bonding

In the thermal compress bonding process, dies can be placed and bonded to the pad by applying heat and pressure in a single step. As a result, the dies do not have to be subjected to a high temperature cycle in the reflow oven. This is especially advantageous for thin dies because they can deform when exposed to heat, thus resulting in failures. Moreover, the Openair-Plasma® process enables to treat the part selectively and avoids a full treatment of the part. This is a major advantage over methods commonly used in the past, which can only treat pads in their entirety. A plasma pre-treatment before applying flux ensures a perfect bond.



### Wire Bonding

As standardized processes in electronics manufacturing, plasma processes ensure clean pads prior to wire bonding. However, a vacuum process entails challenges in terms of process duration and homogeneity. The Openair-Plasma® process can not only be integrated into the production line, but also yields consistent results in seconds regardless of batch size or process time.



### Pre-Molding/Encapsulation

Here, the Openair-Plasma® process delivers higher substrate surface energy, thus providing a stronger bond between the components and encapsulation materials. The result is a more reliable and productive overall package.