

# Static Charge Monitoring & Control

FOR BACK-END SEMICONDUCTOR  
MANUFACTURING

Ionization Solutions



**BONDING,  
ASSEMBLY &  
TESTING**

**SIMCO ION**™  
An ITW Company



# ESD Hazards in Semiconductor Back-End Manufacturing

Static charge is generated throughout the semiconductor manufacturing process, affecting productivity and yield in three ways:

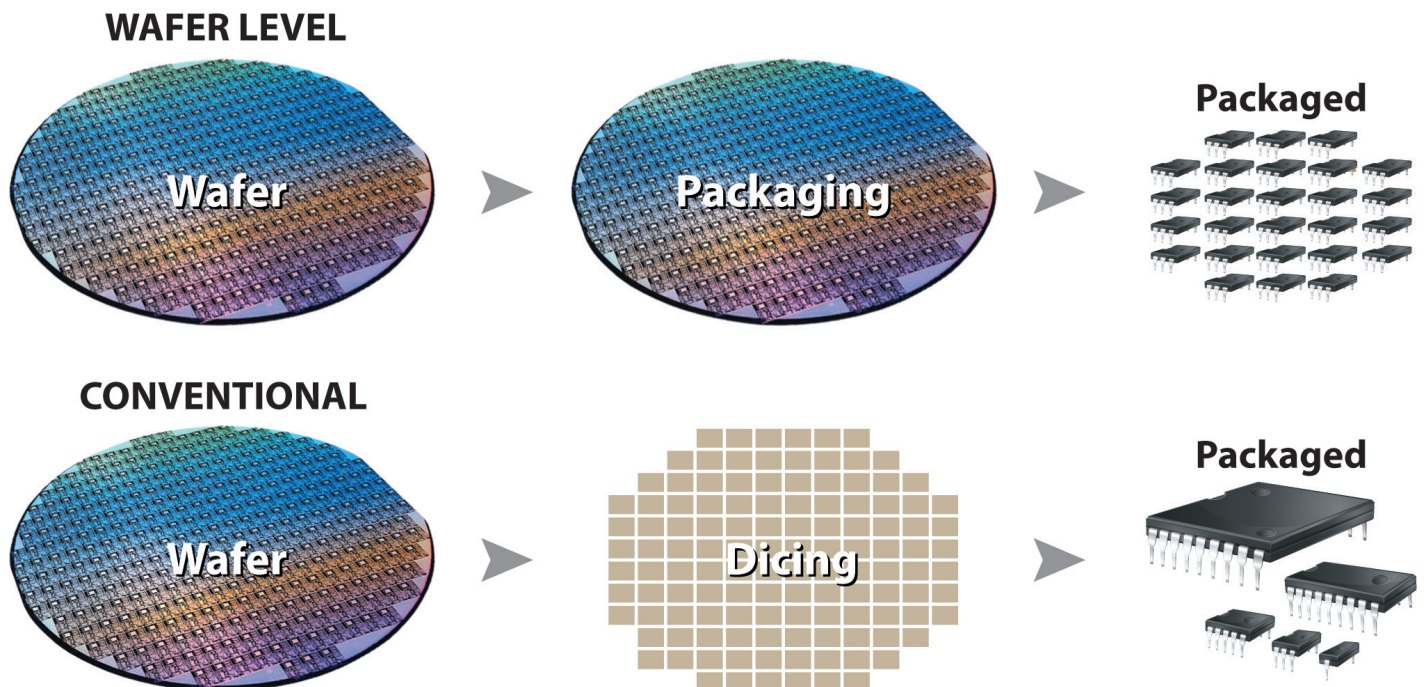
- **Electrostatic Attraction (ESA):** Static charge electrostatically attracts particles from the air causing potential yield loss on bonding and packaging.
- **Electrostatic Discharge (ESD):** Voltages cause instant or latent defects on packaged chips.
- **Electromagnetic Interference (EMI):** Can also cause microprocessor lockup and robotic malfunctions that lead to product flow interruptions and costly tool downtime.

ESD hazards arise primarily from the contact and separation of dissimilar materials. Other factors that contribute include low humidity, high temperatures and inability to ground moving parts, metal to metal and suction cup contact.

In the semiconductor back-end processes, a number of potential ESD hazards will be imposed during wafer mount and saw on highly charged films, bonding with very fine-line width, packaging with plastic molding and testing to assure the device functionality when in-socket tested. With advanced packaging technology and intelligent circuitry design to put complicated systems in a small chip, its sensitivity to electrostatic charge levels are increased.

## Ionizers in Assembly, Packaging & Testing

Monitoring, analyzing and controlling electrostatic charge (ESC) and discharge (ESD) is crucial as the Devices Under Test (DUT) become more sensitive to lower voltage breakdown thresholds. Using the Charged Device Model (CDM) of testing, ESD has been shown to account for as much as a 25% and higher of yield loss in semiconductor backend manufacturing. During the bonding, assembly, packaging and testing phases of semiconductor manufacturing; monitoring problem areas, analyzing the results and controlling potential issues are the only way to reduce yield loss stemming from ESD threats. Simco-Ion provides the complete solution to monitor and control important voltage levels in a process, eliminating the need for random checking.



*Wafer Level Packaging vs. Conventional Packaging*

# Complete System Solution

For every type of process in the final manufacturing phase, our portfolio of products offer the right solutions for monitoring, analyzing and controlling environment factors.

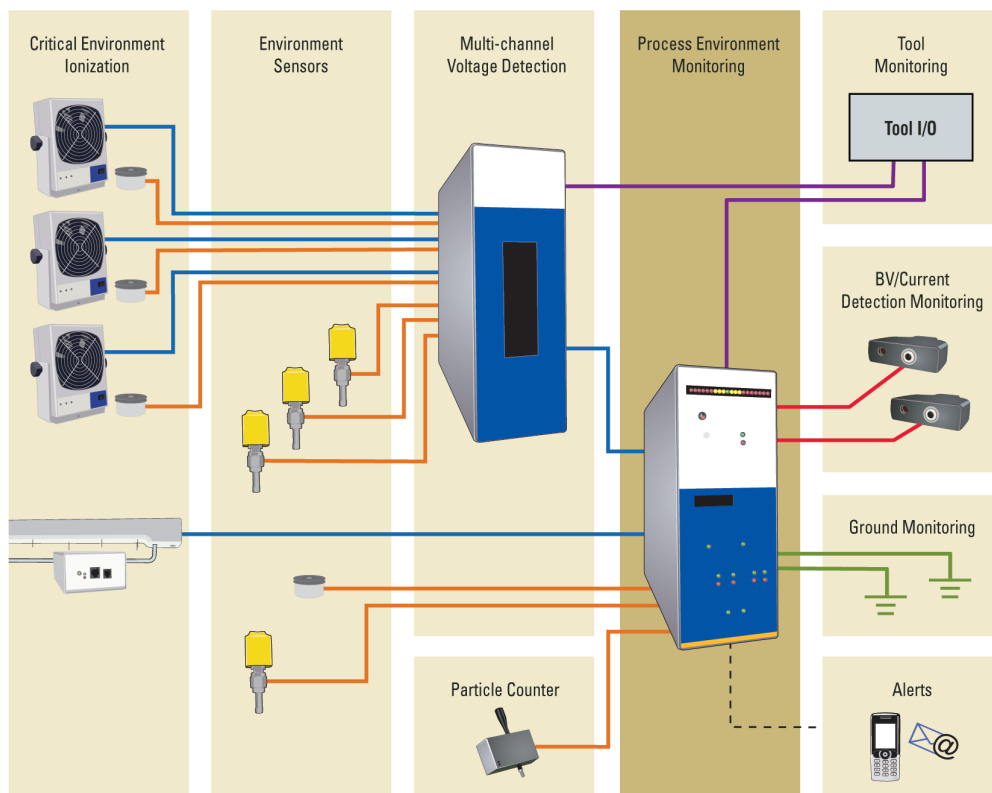
## Monitoring

Everywhere that there is the potential for voltage, on personnel and moving parts as well as around product, continuous monitoring is required.

**Novx Series 7000 Process Monitor** offers continuous monitoring of ESC, ESD and ionizers and is fully configurable through the selection of the appropriate options/ accessories (Data collection), such as ground monitoring and particle counter interface.

**Novx Series 3352 & 3362 Voltage Detection Systems** offers ionizer monitoring and feedback control. The Series 3352 is capable of monitoring electrostatic field with large amplitude range while the Series 3362 features decay time testing of any monitored ionizers. Both can be configured with the MiniPulse option for ESD Event Detection.

**Novx MiniPulse ESD Event Monitor** is designed to detect ESD events happening in processes, especially for well-defined small areas, through the specific antenna selection and placement.



## Control

**Model 5802i, 5810i, 5822i, 5832 Critical Environment Ionizing Blowers** with Novx feedback sensor, directs  $\pm 1V$  balanced ionized air to control areas inside the equipment.

**Model 6432e & 6422e Point of Use Ionizers** with IsoStat technology, provides reliable control to prevent static build-up during processes.

**Quadbar 4630 & 4635** with unique quadrapole configuration, ensures effective ionization as close as 3 inches with or without air-assisted.

**AirForce 6115** is lightweight, ergonomic and provides handheld blow-off ionization.

**AeroBar 5225** is good for in-tool applications and mini-environments with an aerodynamic design and cleanroom compatible materials which will reduce charges to comply with E-78 Level I & II.



Novx 7000, 3353/3362, MiniPulse Monitors



Models 5802i, 5810i, 5822i, 5832 Critical Environment Ionizing Blowers



Models 4635/4630 QuadBar Ionizer



Models 6422/6432 Ionizing Blowers



Model 6115 AirForce Blow-off Gun



AeroBar 5225 Ionizer

**Model 5515 Room Ionization System** controls the environment's contamination issues where the fine-line width and fine-pitch chips are assembled and packaged.



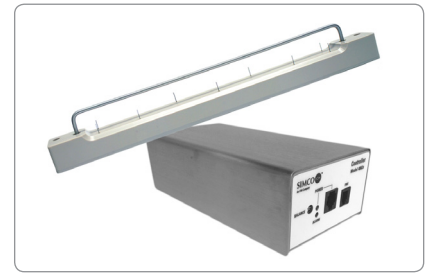
Model 5515 Room Ionization System

**Model 4210 In-Line Gas Ionizer** can work with CDA or Nitrogen plumbing the ionized gas to the static sensitive device or fixture, covering the area.



Model 4210 In-line Gas Ionizer

**Model 4612 Extreme Temperature Ionizer** is selected for operations up to 150°C and down to -50°C which is good for testing in environmental chambers or oven applications.



Model 4612 Extreme High Temp Ionizer

## Standards for Static Charge Control

Several standards have been developed as guides for controlling the costly effects of static charge in fab environments. Ionization has shown to be effective and necessary in implementing these standards.

- The International Technology Roadmap for Semiconductors (ITRS) makes recommendations for maximum allowable voltages on devices, wafer and photomasks, and facility surfaces.
- The Semi E78 guideline helps tool manufacturers and fab owners assess and determine safe, allowable static charge levels inside their tools.
- The ESD Association's ANSI ESD S20.20 standard outlines the development of a fab-wide static charge control program.

## Further Information

Implementing ionization ensures that static charge is controlled before it becomes a barrier to new technology introduction or slows the ramping of new factories.

Visit our website to download general technical notes on ionization, technical articles and papers on ionization for semiconductor manufacturing and datasheets for all the products mentioned in this brochure.

Typical semiconductor back-end manufacturing applications where ionization improves productivity:

- Wafer probe
- Back grinding
- Wafer mount
- Wafer Level
- Bumping
- Dicing
- Die bonding
- Wire bonding
- Molding
- Trim & Form
- Testing



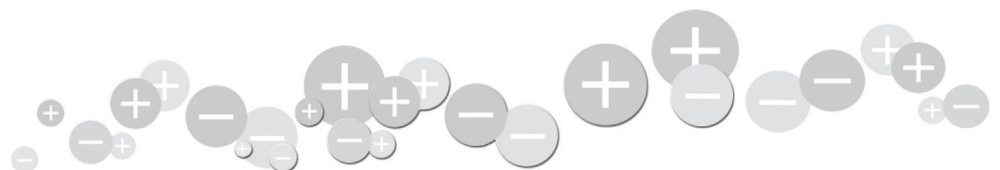
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