



Electrets: A Novel Solution to Dielectric Challenges

OTT1796, OTT1833

Applications

Wide Bandgap (WBG) Power Electronics and Ultra-Wide Bandgap Power Electronics (UWBG)

Target Problems

Advances in WBG power semiconductors provide numerous benefits, including high power density, high efficiency, and the dynamic control of energy, however, such advancements also accelerate electrical aging and increase the risk of premature system failure.

Key Features

- **More Effective** – helps reduce undesired material aging and premature failure in WBG and UWBG power electronics
- **Reducing Partial Discharge (PD)** – demonstrated reduction in PD magnitude and rate under high dv/dt conditions
- **Broad Material Platform** – compatible with both inorganic (e.g., SiO₂/Si₃N₄) and organic (e.g., Parylene) electret materials, enabling high-temperature and application-specific performance

Technology

Dr. Chanyeop Park and his team have developed novel electret-based materials and structures, both inorganic and organic, to address partial discharge (PD) challenges in advanced power electronic systems. This technology employs an electret-based PD mitigation approach that neutralizes high electric fields at critical triple-point locations through electric field cancellation.

Electrets are dielectric materials embedded with net positive or negative charge or aligned dipoles and function as the electrical equivalent of permanent magnets. The disclosed platform includes electrically charged inorganic thin films, such as silicon nitride supported by silicon dioxide, as well as organic polymer electrets such as Parylene. These material options allow tuning of performance across operating temperature, voltage, packaging architecture, and manufacturing constraints.

Intellectual Property

US Utility Patent Pending.

About the Inventor(s)

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