

SOLID-STATE TRANSFORMERS (SSTs)

PEAK NANOPLEX FILM INTEGRATED CAPACITORS **ENABLE NEXT-GENERATION SSTs**

79%
SURGE

IN POWER DEMAND

THE CHALLENGE: A POWER GRID UNDER PRESSURE

CRITICAL ENERGY INFRASTRUCTURE REQUIRES MODERNIZATION

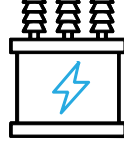
The global power grid is undergoing unprecedented expansion, with power demand projected to surge 79% by 2050. Meeting this demand will require major infrastructure upgrades and bold innovation.



Artificial intelligence (AI), Electric vehicles (EVs), decentralized renewables, and electrification of residential and industrial systems are placing unprecedented strain on the grid



Designed for a different era, the traditional power grid is struggling to maintain efficiency and reliability—leading to rising power losses in transmission, escalating operational costs, and more frequent system failures



Legacy energy infrastructure – especially magnetic-core transformers – is too bulky, analog, and inflexible to meet today's demands

Transformers are essential for managing voltage levels and moving electricity safely and efficiently from source to destination.

To modernize the grid, ensure reliable electricity flow, and meet soaring demand, grid operators must adopt next-generation transformers.

HIGHER
EFFICIENCY

MODULAR
SCALABILITY

THE SOLUTION: SOLID-STATE TRANSFORMERS (SSTs)

A LEAP FORWARD IN ENERGY TECHNOLOGY

Solid-State Transformers (SSTs) are semiconductor-based power conversion devices providing **higher efficiency, bidirectional power flow, and modular scalability** compared to traditional magnetic-core transformers.

These **compact and programmable** transformers offer **real-time control, load balancing, and two-way energy flow** – key capabilities for managing a dynamic power grid, optimizing energy use, and integrating decentralized renewables.

	TRADITIONAL MAGNETIC-CORE TRANSFORMERS	SOLID-STATE TRANSFORMERS
Design	Bulky, Analog	Compact, Digital
Control	Static	Real-Time Programmable
Energy Flow	One-Way	Bi-Directional
Integrations	Limited	AI, Renewables, and Smart-Grid Ready
Maintenance	Reactive	Predictive
Efficiency	20% Higher Average Energy Losses	Reduces energy losses by up to 50%

Solid-State Transformers depend on advanced capacitors for voltage stabilization, harmonic filtering, and energy storage. At the heart of these capacitors is a component critical to SST performance: dielectric film.



UP TO
50%
SMALLER
AND LIGHTER

THE EDGE: NANOPLEX FILM INTEGRATED CAPACITORS

PEAK NANOPLEX FILMS SIGNIFICANTLY ENHANCE CAPACITOR PERFORMANCE FOR MODERN SSTs

Peak NanoPlex films enable breakthroughs in capacitor technology, providing enhanced thermal stability, superior energy density, and greater durability compared to traditional BOPP capacitors.

ADVANTAGES OF NANOPLEX FILM VS. BOPP	
Higher Energy Storage	Nanolayered technology enables up to 4x more energy storage
Reduced Footprint	Capacitors up to 50% smaller and lighter, enhancing efficiency and reducing impedance
Longer Lifespan	High durability enables capacitor lifespan up to 5x longer
Higher Duty Cycles	3-5x higher duty cycles , ideal for high-performance applications
Superior Temperature Tolerance	Withstands temperatures up to 135 °C, exceeding BOPP by 30°C+
Bill of Materials (BOM) Savings	Significant cost advantages, enabling capacitor manufacturers to cut BOM costs in half
US-made, 20+ global patents	Manufacturers exposed to supply chain vulnerabilities with ~80% of BOPP film production concentrated in China

Capacitors featuring **NanoPlex film technologies** enable **Solid State Transformers** to address the stringent requirements of grid modernization.

ADVANTAGES OF NANOPLEX INTEGRATED SOLID STATE TRANSFORMER		
 High-Frequency Reliability Stable performance under fast-switching conditions	 Energy Density More power & faster discharge in a smaller footprint	 Thermal Resilience Exceptional stability at high temperatures
 Precise Regulation Consistent output in changing load conditions	 Breakdown Strength Withstands high voltage & mechanical stress	 System Adaptability Ready for variable & complex applications

By integrating **NanoPlex film**, capacitor manufacturers can create **compact, efficient, and reliable capacitor banks** tailored for **modern Solid State Transformer modules** and practical for large-scale deployment.



THE BIG PICTURE: SSTs POWER THE MODERNIZED GRID

NANOPLEX FILM INTEGRATED CAPACITORS ENABLE SSTs TO SUPPORT POWER FOR POWER GRID MODERNIZATION

Modern Solid-State Transformers are essential for powering the next generation of energy infrastructure, including:



EV charging networks and grid-scale energy storage systems



Decentralized renewables like solar and wind



Equitable, reliable energy access for residential and industrial systems

Peak NanoPlex film isn't just a material upgrade – it's the foundation of next-generation SSTs and a driving force behind grid modernization.

