Performance and Reliability Gains in UHV SiC Using Advanced Power Devices and Packaging Technologies

Sascha Dern, Vice President Sales, EMEA & India
Navitas Semicondcutor
December 2, 2025

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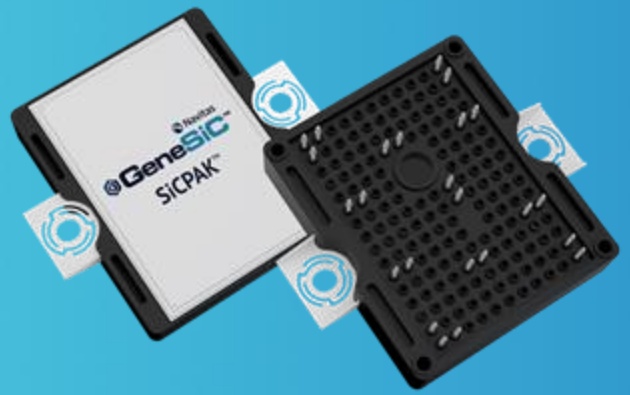

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Navitas

Electrify Our World™

Navitas 2.0: Positioned for UHV Markets

2014
Founded

Only GaN + SiC
Pure-play WBG

>300
Mpcs shipped

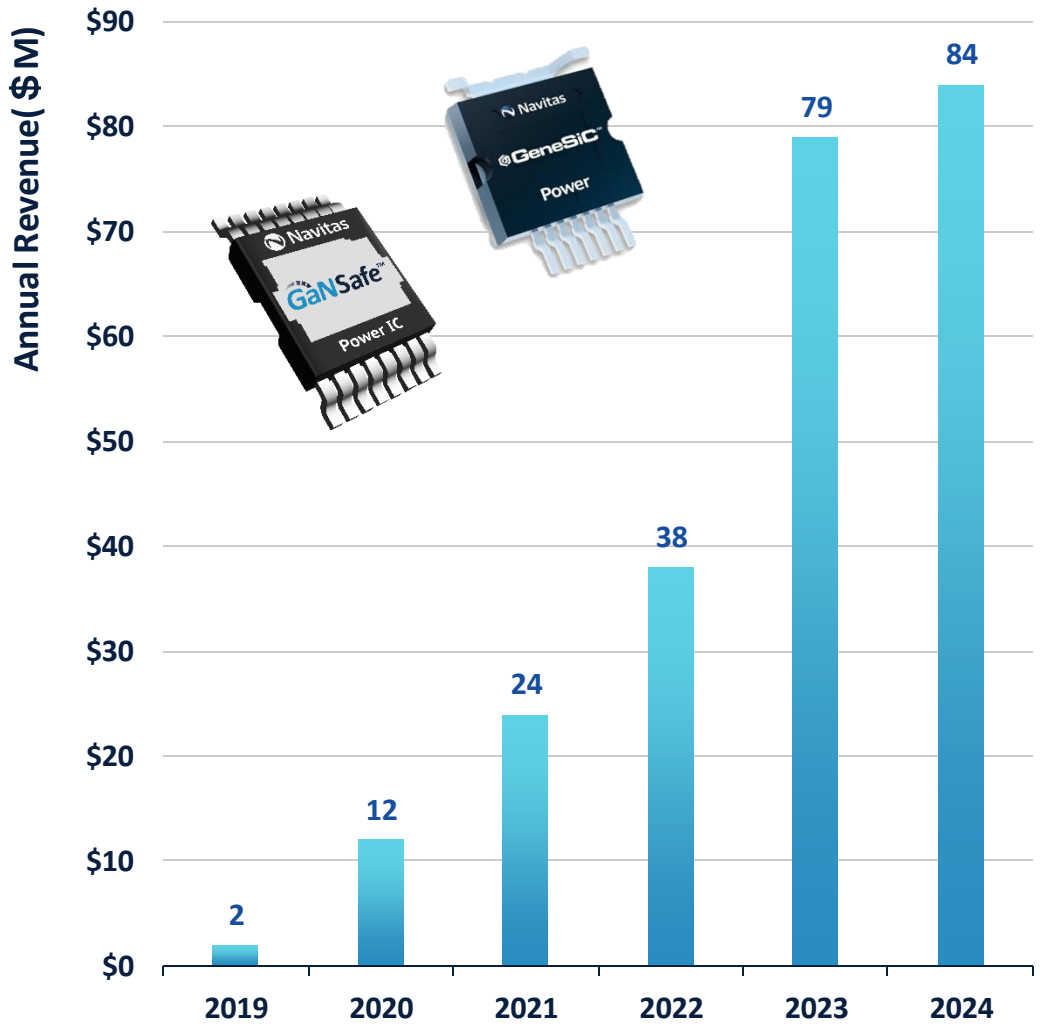
700%
growth & Deloitte Fast 500 (3 yrs)

+300
Patents issued or pending

$250M
Cash held with no debt

Focus Markets

- AI Data Center
- Performance Computing
- Energy and Grid Infrastructure
- Industrial electrification



AI Data Centers and Renewable Energy are transforming Grid Infrastructure and Driving Unprecedented Investment

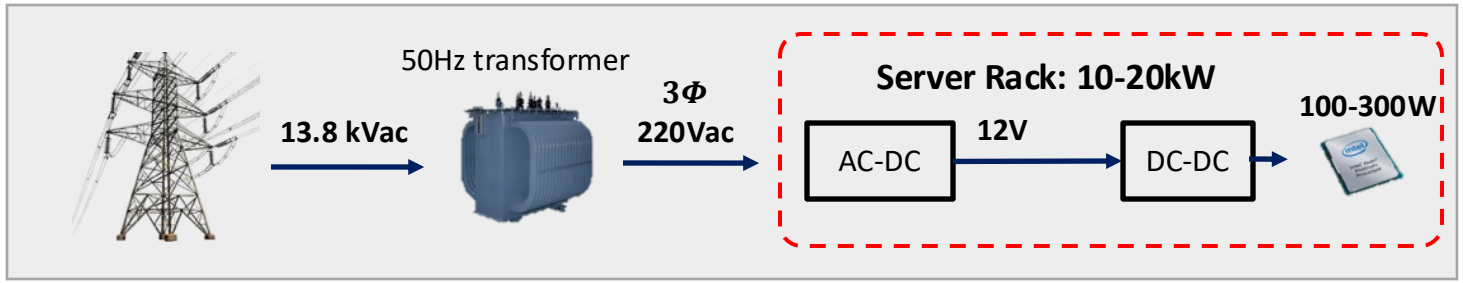
- **Significant upgrades are underway in Energy, SST, Data Centers**

- **Wide Band Gap Power Semiconductors are critical to delivering:**
  - Higher Voltages ➔ 1.7kV +
  - Higher Power ➔ 1MW +
  - Greater Efficiency ➔ 90% +
  - Longer Reliability ➔ 20 years +
  - Scalability➔ Reduced material and system costs

- **Achieving these goals requires advanced Power Devices and Packaging**

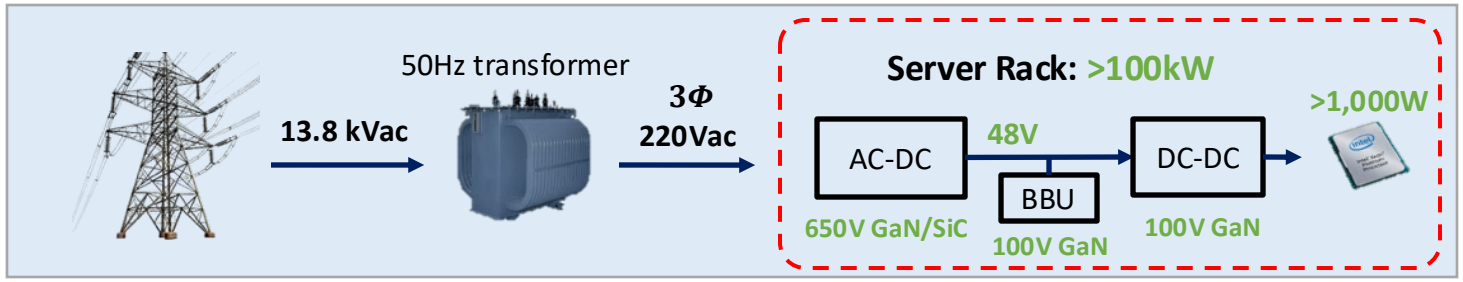
Example: Grid Efficiency Driving UHV SST

Traditional 12V Data Centers



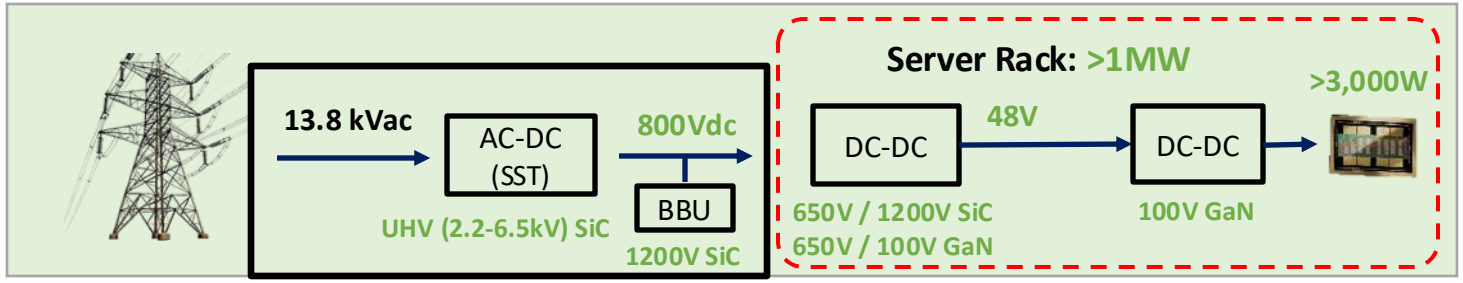
- 70-80% total energy efficiency
- 100% Si-based power systems
- Limited GaN or SiC use today

Today's AI 48V Data Centers



- 80-90% total energy efficiency
- Significant GaN / SiC use
- 2030 Requirements: $1.4B/yr

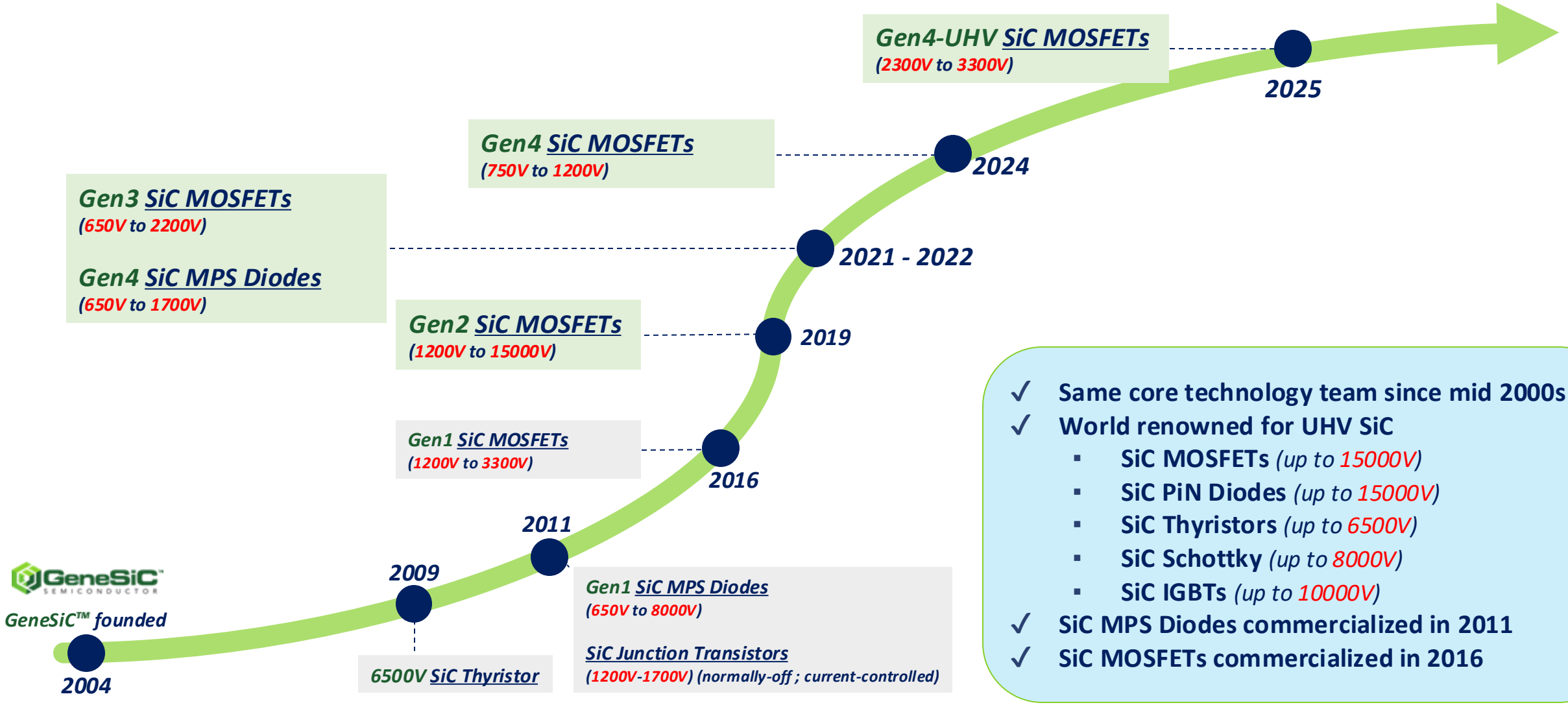
Future AI 800V Data Centers



- Target over 90% total energy efficiency
- Accelerating GaN / SiC use
- 2030 Requirements: $2.6B/yr

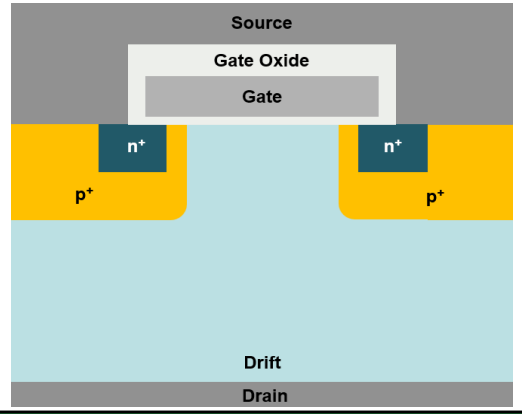
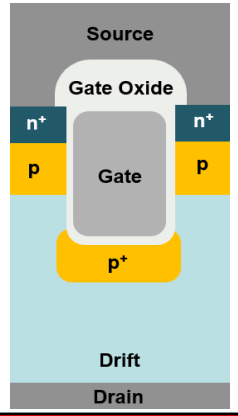
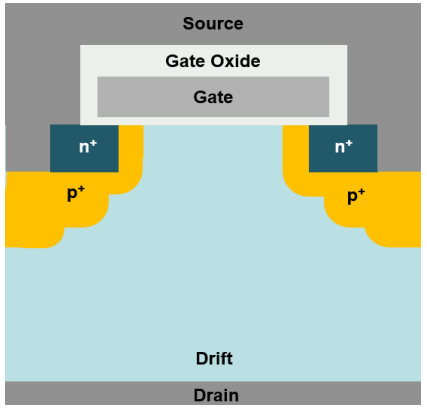
SST Accelerating Demand for UHV Power Semi

Navitas GeneSiC™ Technology: 21+ Years of SiC Innovation



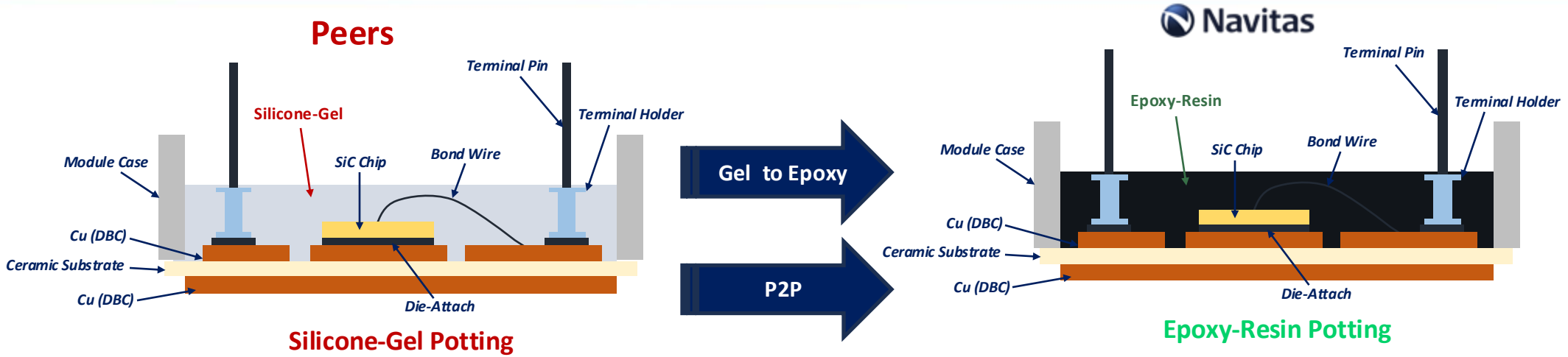
- ✓ Same core technology team since mid 2000s
- ✓ World renowned for UHV SiC
  - SiC MOSFETs *(up to 15000V)*
  - SiC PiN Diodes *(up to 15000V)*
  - SiC Thyristors *(up to 6500V)*
  - SiC Schottky *(up to 8000V)*
  - SiC IGBTs *(up to 10000V)*
- ✓ SiC MPS Diodes commercialized in 2011
- ✓ SiC MOSFETs commercialized in 2016

Navitas GeneSiC™ Trench-Assisted Planar SiC Technology

	Traditional Planar	*Standard Trench*	*Trench-Assisted Planar*
			
Manufacturability	✓ Repeatable ✓ High yield ✓ Low cost	– Inconsistent trench etch – Lower Yields – High Cost	✓ Repeatable ✓ High yield ✓ Low cost
Performance	– High $R_{DS(on)}$/ area – Slow Switching	✓ Lower $R_{DS(on)}$/ area ✓ Faster Switching	✓ Lower $R_{DS(on)}$/ area ✓ Faster Switching
	✓ Low RDS(on)/ Δ temperature	– High $R_{DS(on)}$/ Δ temperature	✓ Lowest $R_{DS(on)}$/ Δ temperature
Reliability	✓ Rugged gate oxide (stable V_{TH})	– Failures due to non-uniform gate oxide – Lower short-circuit capability	✓ Highest 100% tested avalanche ✓ Long short-circuit withstand time ✓ Rugged gate oxide (stable V_{TH})

Trench-gate advantage does not extend to SiC

Epoxy Fill for Dramatically Improved Reliability



Reliability Improvements	Navitas SiCPAK™ Qualification	Competitor Qualification
Temperature Cycling (-55°C to 150°C)	**>1000 cycles**	<100 cycles
Thermal Shock Test (-40°C to 125°C)*	**>1000 cycles**	<100 cycles
Temperature Humidity Bias *(THB / HV-H3TRB)*	1000 hrs 80% V_{DS} THB at **module-level** 1000 hrs 80% V_{DS} HV-H3TRB die-level	1000 hrs 80% V_{DS} die-level only

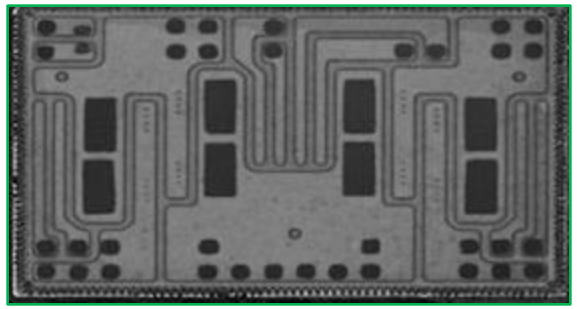
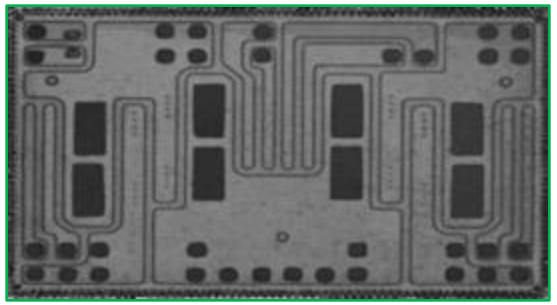
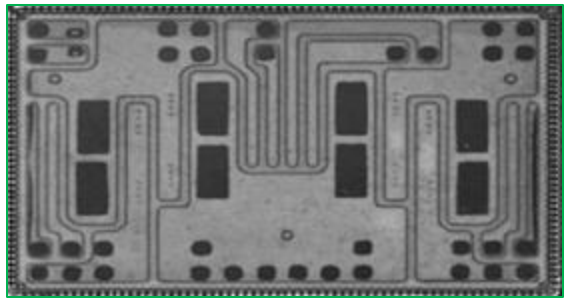
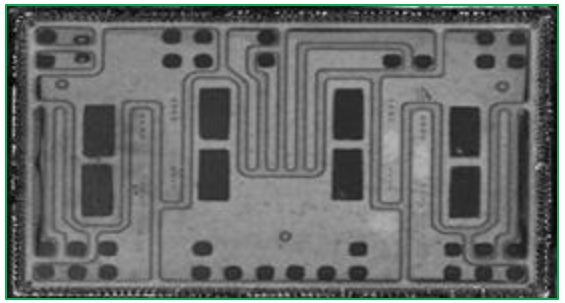
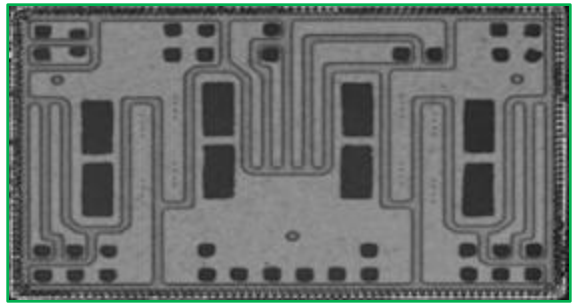
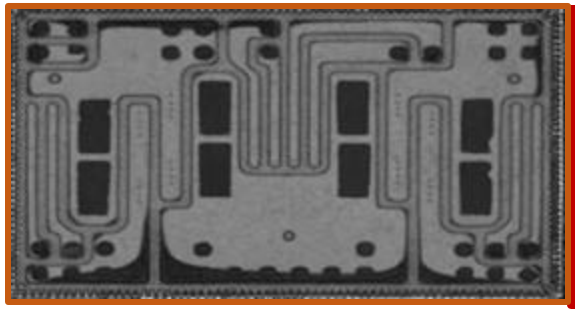
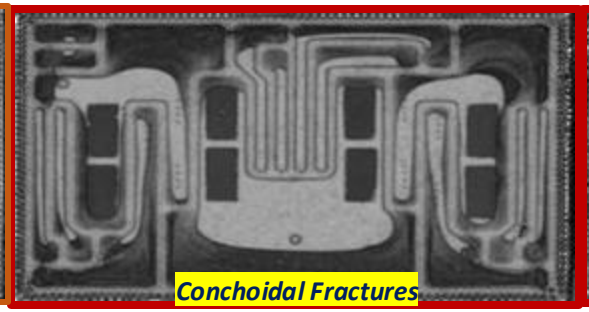
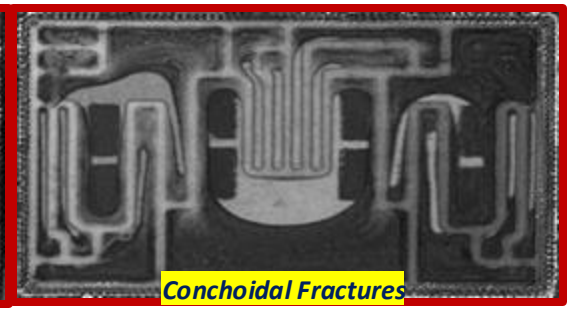
***After 1000 cycles of Thermal Shock Testing**

Up to 15% thermal resistance increase for epoxy-resin vs. 33%-80% increase for silicone-gel

All epoxy-resin potted modules passed isolation tests; all silicone-gel modules failed

Designed for >10x Better Thermal Shock Reliability

Thermal Shock Testing (-40°C to 125°C)

	T0	100 Cycles	500 Cycles	1000 Cycles
Epoxy-Resin				
Silicone-Gel				

Results after <u>1000 cycles of Thermal Shock Testing</u>

- ✓ Up to 15% thermal resistance increase for epoxy-resin vs. 33%-80% R_{th} increase for silicone-gel
- ✓ All epoxy-resin potted modules passed isolation tests; all silicone-gel modules failed isolation test

Thank you!

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www.navitassemi.com

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