



## PRODUCTIZATION OF 3.3 kV & 700 V SILICON CARBIDE MOSFETS

**Objectives:** Proposed efforts would focus on commercialization of advanced 700 V SiC MOSFETs that can compete with Si superjunction products and 3.3 kV MOSFETs, including reliability assessments and production scale-up. Build state-of-the-art reference designs to gain adoption in auto and industrial markets.

Task No. BP5-2-20.A

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## SiC Applications



Markets	Applications	High Temperature	High Frequency	Small, Light System	Low Loss, Efficiency
Commercial Avionics	 Actuation Air Conditioning Power Distribution	X	X	X	X
Defense Oil drilling	 Motor Drives Aux. Power Supplies	X	X	X	X
Transportation Automotive	 HEV Powertrain EV Battery Charger DC/DC Converter Energy Recovery	X		X	X
Solar Energy	 PV Inverter		X	X	X
Wind turbine	 Inverter		X	X	
Industrial	 Motor drives Welding UPS, SMPS Induction Heating		X	X	X
Medical	 MRI power supply X-Ray power supply		X	X	X

## WBG TECHNOLOGY IMPACT

- WBG Benefits:** Inherently faster switching operates at higher frequencies while generating lower power losses, for higher efficiency. High ruggedness provides pathway for WBG to enter mission-critical applications such as T&D and traction.
- Markets:** Automotive, Transmission & Distribution, High Power Traction, High Performance Industrial, Aerospace & Defense.
- Commercialization:** 12 months.
- Market Penetration:** Superjunction Si devices ( $\leq 650$  V) comprise a significant portion of the power semiconductor market is ripe for displacement if the economics of WBG work out. HV SiC devices replacing current Si IGBT solutions require  $\geq 2$  kV and could form a significant part of the WBG market share.

## ACCOMPLISHMENTS/OUTCOMES

- Impact on the cost of WBG compared to Silicon:** Using 6" Si CMOS fab drastically reduces \$/Amp, commercial foundry reduces defects & increases yield, R&D cycle times reduced
- Potential for Job Creation & Economic impact:** US based design & fabrication keeps and creates high-tech jobs onshore, increasing US competitiveness in semiconductors
- Technology maturity :** Rapid entry of 3.3 kV SiC devices opens up new markets for WBG