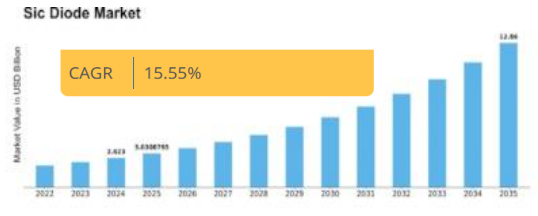


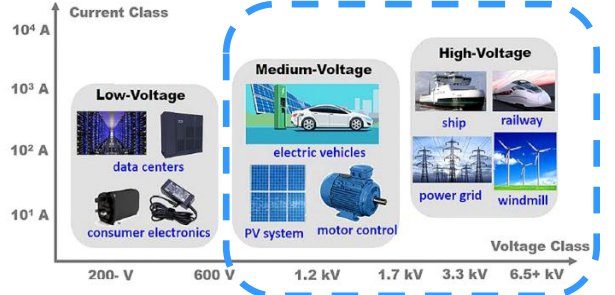
# New metallization Mo-based for SiC JBS devices

M. Vivona, P. Fiorenza, G. Greco, R. Lo Nigro, S. E. Panasci, E. Schilirò, S. Di Franco, F. Giannazzo, F. Roccaforte

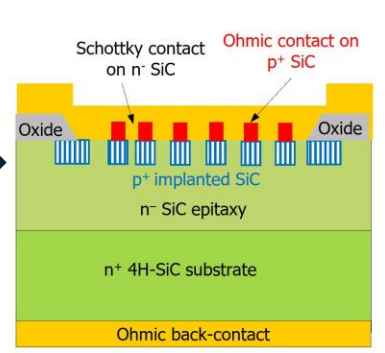
## SiC Diode Market Size and Applications:



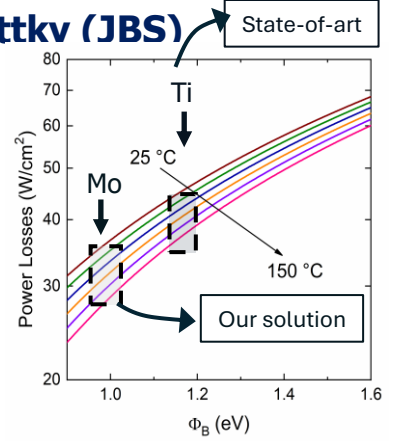
→ SiC diode industry projected to grow to 12.86 USD Billion by 2035.



## 4H-SiC devices: Junction Barrier Schottky (JBS)



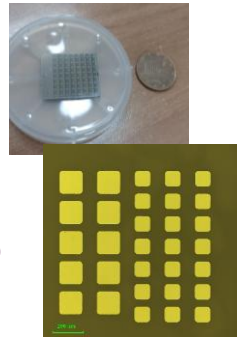
**Standard solution:** Ti/4H-SiC diodes.  
**Target improvement:** 20% reduction of static power losses by using low work-function material for Schottky contact.



## Schottky contact for test (TRL 3-4)

Processing Flowchart

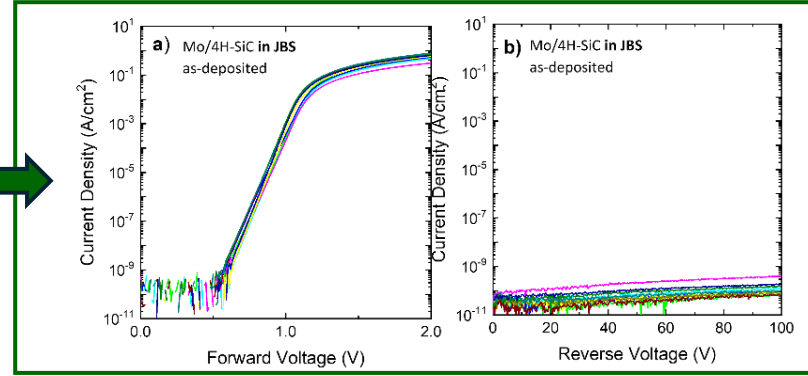
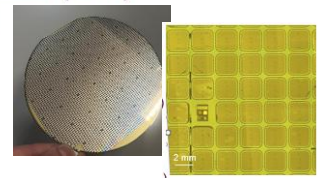
- Cleaning (CNR)
- Back-Side contact (CNR) (Ni deposition+ RTA)
- Lithography (CNR)
- Front-Side contact (CNR) (Mo deposition + RTA)
- Lift-off (CNR)



## Schottky contact implemented in JBS (TRL 6)

Processing Flowchart

- Cleaning (ST)
- Back-Side contact (ST)
- p-well implantation and Ohmic contact (ST)
- Front-Side Schottky contact (CNR) (Mo deposition + RTA)
- Lithography (ST)
- Wet-etching (CNR)

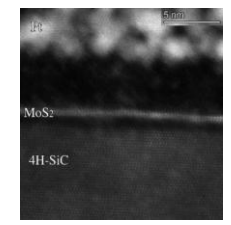
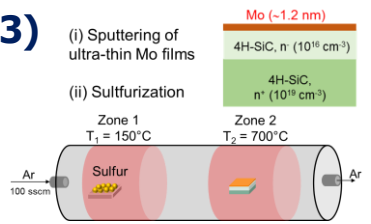
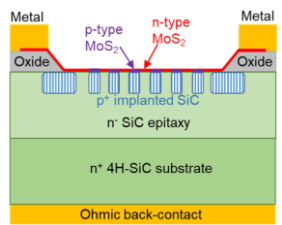


M. Vivona, P. Fiorenza, G. Greco, S. Di Franco, G. Bellocchi, P. Mancuso, S. Rascunà, A. M. Mio, G. Nicotra, F. Giannazzo, F. Roccaforte, Mater. Sci. Forum 1158 (2025) 27

## Proof of concept of the growth process (TRL 3)

**Standard solution:** Different metal for Schottky and Ohmic in JBS.

**Target improvement:** Simultaneous Schottky and Ohmic contact.



F. Giannazzo, et al., Mater. Sci. Semicond. Process. 174, 108220 (2024); F. Roccaforte, et al. Appl. Phys. Lett. 124, 102102 (2024)

**Patented solution:** Use of monolayer 2D semiconductors (e.g. MoS<sub>2</sub> having a favourable band alignment with SiC)

CONTEXTUAL FORMATION OF A JUNCTION BARRIER DIODE AND A SCHOTTKY DIODE IN A MPS DEVICE BASED ON SILICON CARBIDE, AND MPS DEVICE

Applicant: STMICROELECTRONICS S.r.l., Agrate Brianza (IT)  
Inventors: Filippo GIANNAZZO, Catania (IT); Giuseppe Greco, Misterbianco (IT); Fabrizio ROCCAFORTE, Mascaliuca (IT); Simone RASCUNA', Catania (IT)  
Assignee: STMICROELECTRONICS S.r.l., Agrate Brianza (IT)

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