HIGH TEMPERATURE PACKAGES FOR WBG SEMICONDUCTORS
FUTURE POWER ELECTRONICS SOLUTIONS

Features

- High temperature capability ≥ 250 °C
- High active and passive cycling capability
- Double sided cooling
- Fast switching with WBG, high power density
- Flexible design of 3-dimensional integrated power modules
- High current carrying capability, thick copper metallizations

Packaging concept

- Embedding of WBG devices in ceramic substrates
- Double sided sintering of WBG devices in ceramic substrates
- Ceramic insulation, Al₂O₃ / AlN / Si₃N₄
- Thick aluminum and copper metallizations ≤ 800 µm
- Soldering and silver sintering technologies
- Vias in multilayer DBC stacks

Applications

- Electric vehicles, aerospace, railway & tramway, military, space and defense, solar inverters, down hole oil drilling, sensor technologies, geothermal instrumentation
**Ceramic embedding**
- Laser structuring of ceramic substrates
- Soldering or silver sintering of devices
- Filling of vias
- Sealing and stacking of embedded package

**Vias in DBC substrate**
- Laser drilling of blind-holes or through-holes
- Via filling by stencil printing, dispensing or mechanical pressing
- Via materials as silver paste, copper paste or copper rivets

**Double sided sintered power module**
- DBC sandwich concept
- Two level etching of substrate metal
- SiC devices sinterable on both sides
- Laser welding of metal housing

**4H-SiC high temperature sensing & electronics**
- Mixed-signal circuits operating at temperatures beyond 250 °C
- Combination of sensing function with on-chip amplification and Smart-Power IC for actuation
- Temperature-sensitive diodes operating in constant current forward bias mode (CCFB)
- High sensitivity (dV/dT) up to 4.5 mV/K
- High linearity up to 500 °C

2 Mounted 4H-SiC UV-sensor
3 SiC devices embedded in a DBC substrate
4 Concept of double sided power module
5 SiC devices double sided sintered in DBC substrates
6 V-T-characteristic of a 1.3 mm² temperature sensor in CCFB mode