MASTERBOND®
CASE STUDY

MasterSil 800: Used as a high-temperature encapsulant for a wide-bandgap semiconductor

Master Bond Inc. 154 Hobart Street, Hackensack, NJ 07601 USA
Phone +1.201.343.8983 | Fax +1.201.343.2132 | main@masterbond.com

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Overview of MasterSil 800

MasterSil 800 is a one component elastomeric compound for bonding, sealing, coating, and small encapsulation applications, especially at high temperatures of up to 572°F. It is non-corrosive to electronics and bonds well to a wide variety of substrates, including silicone rubber.

Application

Silicon-based microelectronics typically operate below 150°C, but wide-bandgap devices can operate well above this temperature. Although their higher temperature tolerance than conventional silicon-based electronics allows them to be operated at much higher power levels, they must be encapsulated in a material that can also withstand these high temperatures during long-term operation without showing a significant degradation in its dielectric strength. To identify encapsulants suitable for packaging such wide-bandgap devices, a researcher at Virginia Tech evaluated several commercially available high-temperature encapsulants, including MasterSil 800.

Key Parameters and Requirements

The author needed a material capable of encapsulating a wide-bandgap device without significant change in its dielectric properties during long-term high-temperature usage.

First, the author tested the processability of MasterSil 800, which began to cure from its surface within seconds at room temperature when it contacted atmospheric moisture.

The MasterSil 800 was able to fill the gap underneath the chip with no cracks or voids observable by optical microscopy after curing. This shows that MasterSil 800 is elastic enough that it can form a crack-free and void-free layer in a power module.

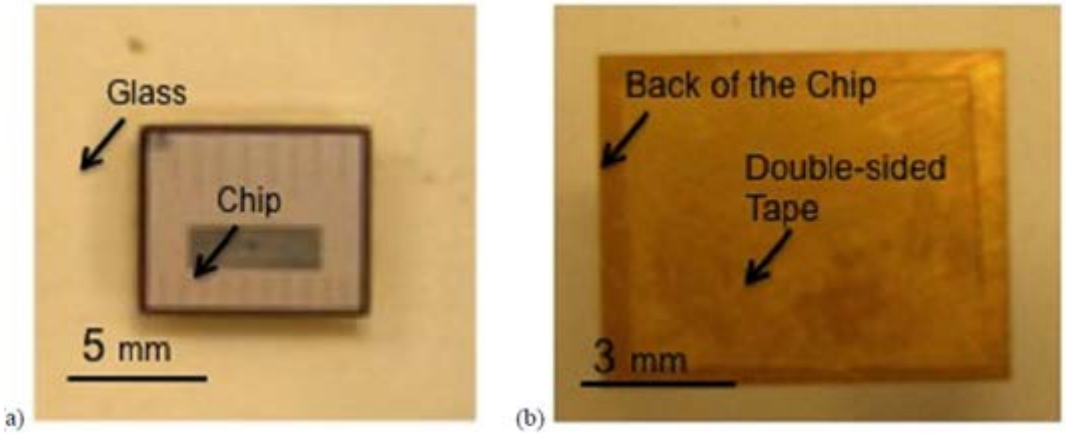

Figure 1. Custom-built device for testing the processability (flowability) of MasterSil 800: (a) top view and (b) bottom view.

Results

Compared with the other commercially available silicone elastomers that were tested in this study, no cracks were observed in MasterSil 800 under optical microscopy post a 28-day, 250°C aging test. Although the dielectric strength dropped from 15 to 5 kV/mm, its permittivity remained fairly stable.

References

Yao, Yiying, Thermal Stability of Al2O3/Silicone Composites as High-Temperature Encapsulants, 2014. https://vtechworks.lib.vt.edu/items/2b1a4238-3edd-472f-bab1-55c1d38800b4