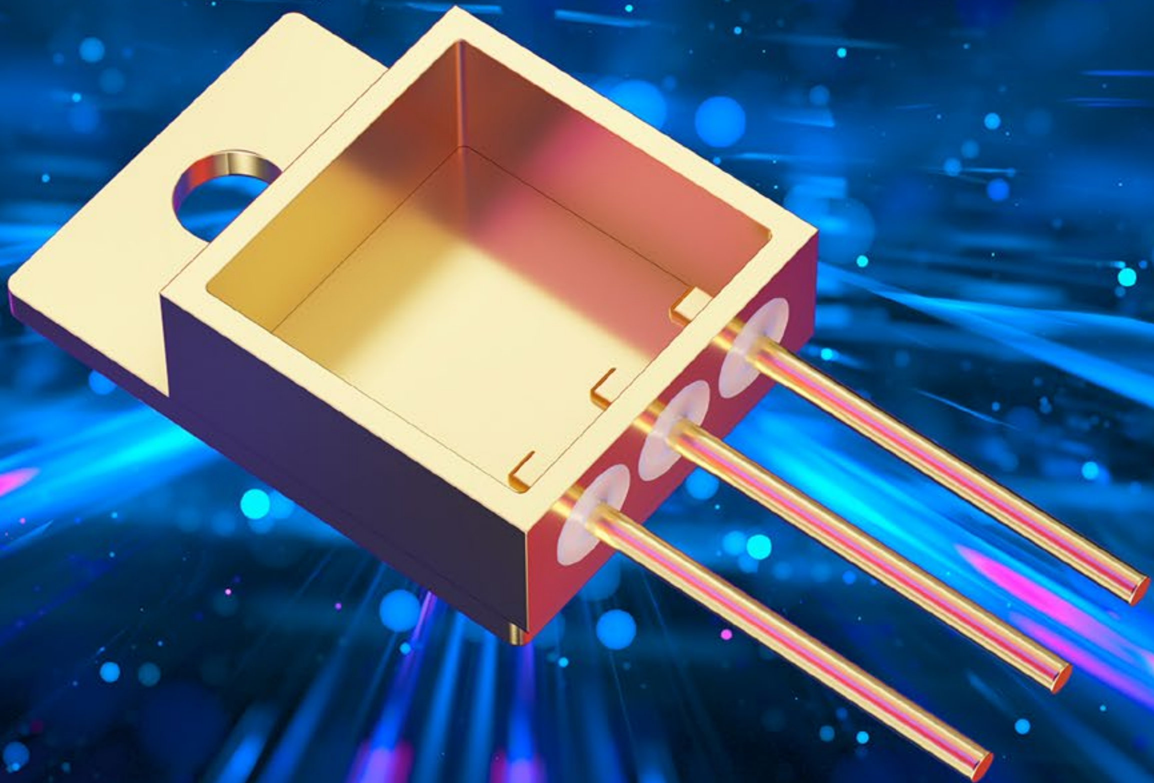
SCHOTT
glass made of ideas



Glass-to-Copper Sealing Technology

Fulfilling the highest heat resistance, heat dissipation and high current requirements with SCHOTT GTCS®.

What is Glass-to-Copper Sealing?

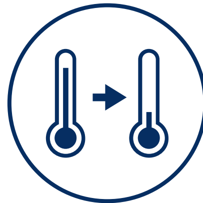
While conventional Glass-to-Metal Sealing typically uses metal materials such as Fe, stainless steel, FeNi and FeNiCo (Kovar), SCHOTT GTCS® directly bonds glass and copper to create hermetic seals, feedthroughs or packaging components. The excellent heat dissipation properties of copper make this technology useful for a broad range of high-power applications.

SCHOTT GTCS® technology allows the design of hermetic packaging components with housings and pins made from copper.

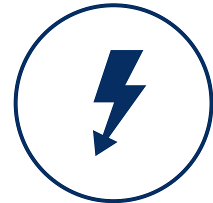
Advantages

SCHOTT GTCS® packages offer the same high heat resistance and hermeticity of conventional hermetic packages with the added benefit of copper's excellent heat dissipation. This enables smaller packages and simplifies cooling systems while also allowing increases in device power and reducing the power consumption of Schottky barrier diodes (SiC-SBDs).

High temperature resistance



High heat dissipation



High current capability

Applications

Usage examples include:

- High-power lasers
- Power devices
- Applications requiring high currents and high heat dissipation

Overcoming challenges

The biggest challenge in creating hermetic glass-to-copper seals lies in the fact that glass and copper typically have vastly different coefficient of thermal expansion (CTE). Because glass's CTE is usually much lower than that of copper, copper will expand and shrink more when exposed to temperature variations.

SCHOTT GTCS® technology is unique because it allows glass to be bonded with copper through careful selection of the right material combination. The sealing is performed in a way that keeps the hermetic bond stable and reliable even in harsh operating environments such as high heat or high current. The careful component design and expert manufacturing processes used to make these seals produce reliable, efficient and high-performance products.

Technical details

Reliability

Through in-house evaluations, SCHOTT GTCS® packages have been proven to maintain high thermal resistance and hermeticity after 3,000 hours and 3,000 test cycles.

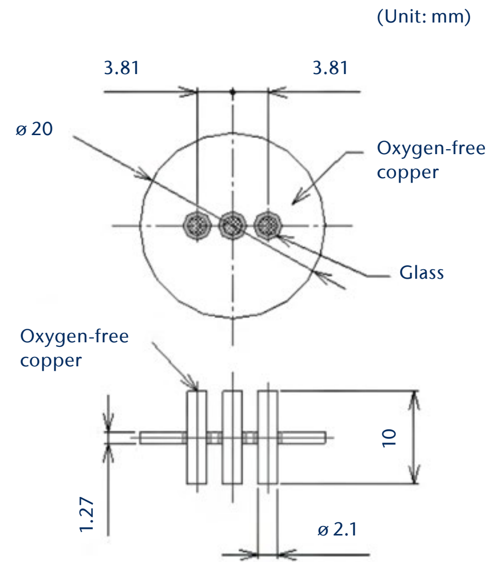
Results from reliability evaluation

Test	Check item	Initial stages	3000 hours 3000 test cycles
High temperature: 300°C	Hermeticity	1×10^{-9} Pa • m³/s max	1×10^{-9} Pa • m³/s max
	Insulation resistance (DC500V)	1×10^3 MΩ min	1×10^3 MΩ min
Temperature cycle: -55°C⇔+125°C	Hermeticity	1×10^{-9} Pa • m³/s max	1×10^{-9} Pa • m³/s max
	Insulation resistance (DC500V)	1×10^3 MΩ min	1×10^3 MΩ min
Constant temperature & humidity: 85°C, 85%	Hermeticity	1×10^{-9} Pa • m³/s max	1×10^{-9} Pa • m³/s max
	Insulation resistance (DC500V)	1×10^3 MΩ min	1×10^3 MΩ min

After 3,000 hours and 3,000 cycles of each reliability test, no deterioration was found.

This data is for reference.

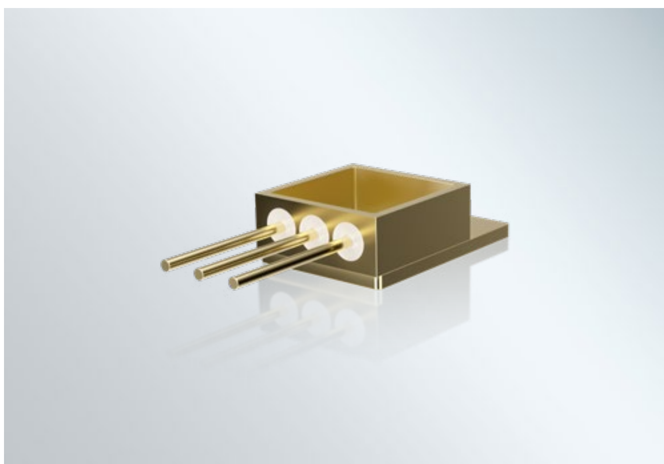
Test sample



Electroless nickel and gold plating was used.

Custom designs

Designs can be customized to meet a wide variety of application requirements such as the examples pictured.



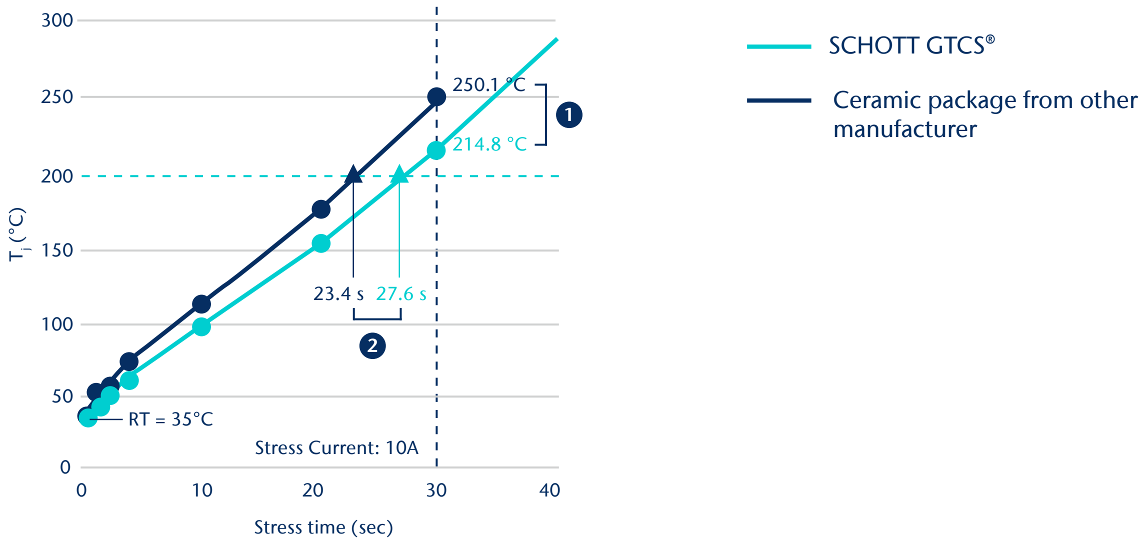
SCHOTT GTCS® vs. Ceramic Packaging

Transient thermal evaluations show that SCHOTT GTCS® packages offer several advantages over ceramic packages. Tests conducted at a room temperature of 35°C and stress current of 10A demonstrated that SCHOTT GTCS® packages have superior heat dissipation and suppress the temperature rise of SiC elements. These tests were performed by an external company.

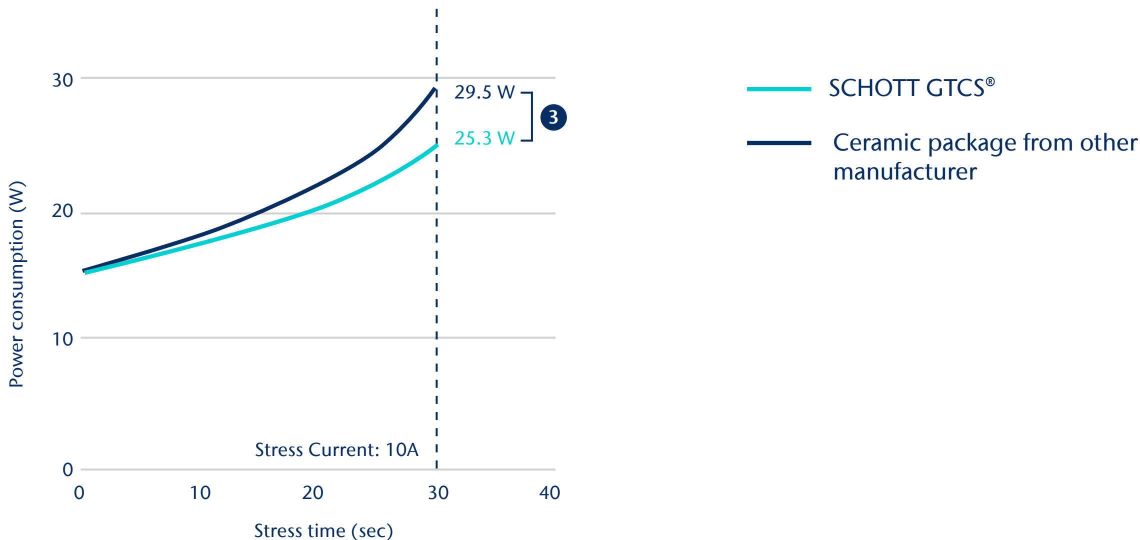
< Test condition > Room temperature 35°C, stress current 10A

1. Suppressed the temperature rise of the SiC element by approximately 35°C under a stress time of 30 seconds.
2. Improved stress time by approximately 4 seconds at 200°C
3. Reduced power consumption by approximately 14%

Stress time and junction temperature (T_j)



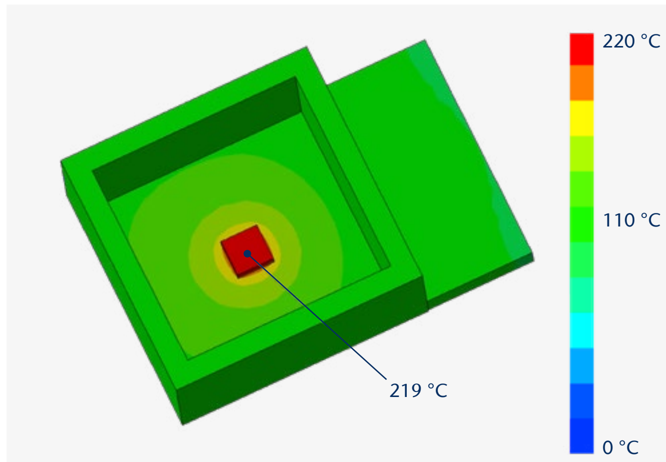
Transient changes in SiC-SBD power consumption



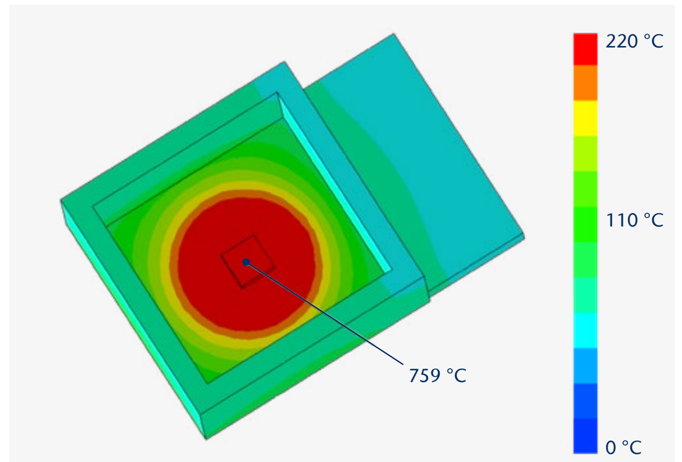
SCHOTT GTCS® vs. Kovar Packaging

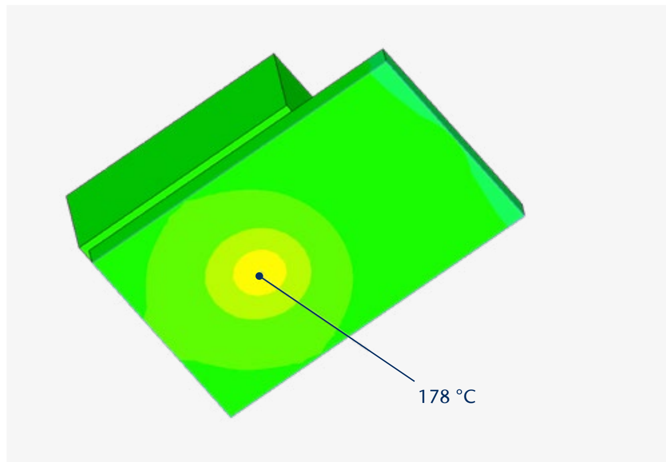
SCHOTT GTCS® packages made of copper have excellent heat dissipation. Thermal simulations show the temperature distribution after loading 100 W for 10 seconds at a room temperature of 30°C on a SiC element in a SCHOTT GTCS® package and a package made of Kovar material:

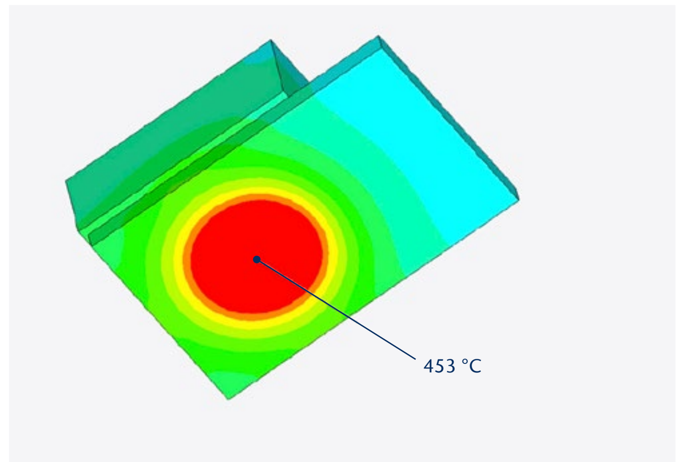
SCHOTT GTCS® Package



Kovar Package







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