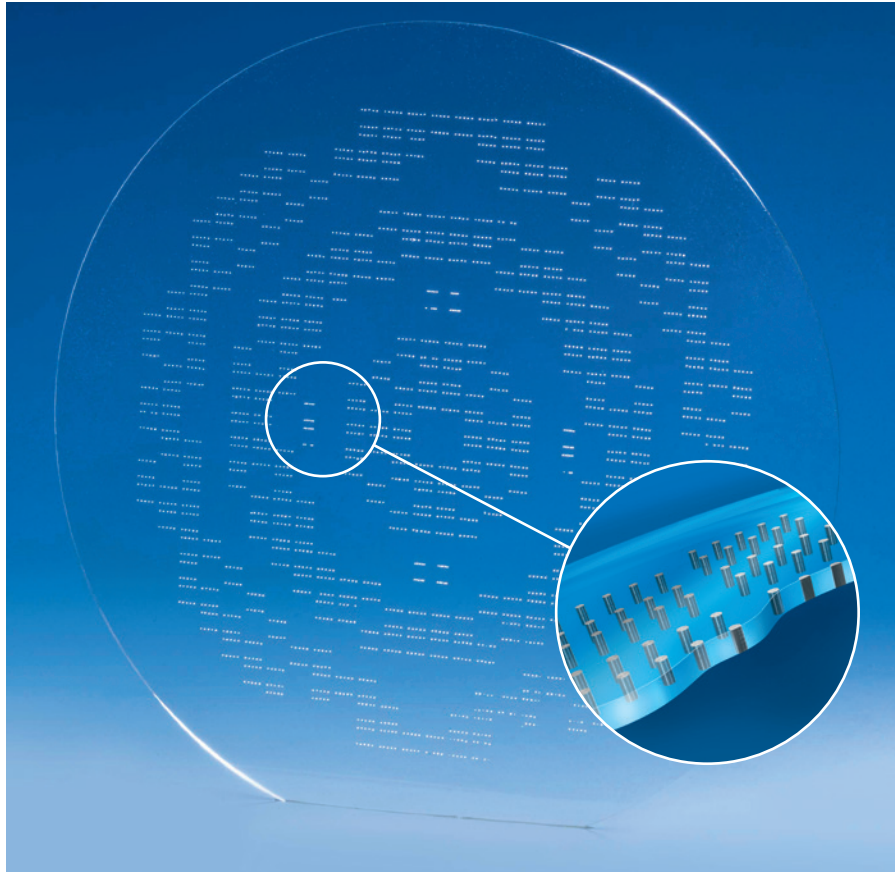


# SCHOTT HermeS<sup>®</sup> Glass Wafers with Hermetic Through Glass Vias (TGV)

For reliable and miniaturized packaging of sensitive MEMS devices



## Introduction

MEMS-powered devices and sensors are often exposed to extremely harsh environments, e.g. pressure sensors in corrosive industrial production lines. Nevertheless they must function perfectly over long periods of time. The reliability and performance of the MEMS device depends on the long-term robustness of the MEMS packaging technology.

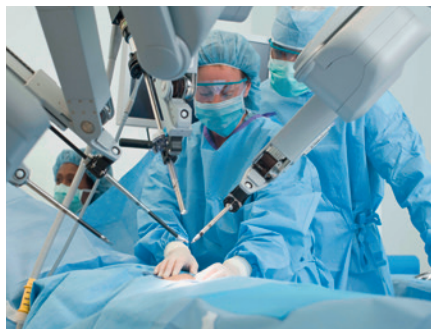
## Product Description

SCHOTT HermeS<sup>®</sup> is a glass substrate with hermetically sealed solid “Through Glass Vias” (TGV). HermeS<sup>®</sup> enables fully gastight and therefore long-term robust enclosures for MEMS devices. The fine-pitched vias allow the reliable conduction of electrical signals and power into and out of the MEMS device. Since HermeS<sup>®</sup> can be placed directly under the silicon MEMS, it makes miniaturized, fully hermetic 3D Wafer Level Chip Size Packaging (WLCSPP) possible.

## Applications



**Industrial Hermetic MEMS Sensor**  
HermeS<sup>®</sup> enables long-term, reliable and extremely rugged packaging of industrial sensors.



**Medical MEMS**  
With HermeS<sup>®</sup>, medical electronics can be packaged robustly to withstand body fluids and sterilization cycles over long periods of time.



**RF MEMS**  
HermeS<sup>®</sup> provides superior RF properties through absolute hermeticity in an extremely miniaturized design.

**SCHOTT**  
glass made of ideas

# SCHOTT HermeS<sup>®</sup> Glass Wafers with Hermetic Through Glass Vias (TGV)

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## Advantages of HermeS<sup>®</sup> compared to TSV (Through Silicon Vias)

- **Superior reliability** of the packaging leads to long term performance of the MEMS device due to higher mechanical, thermal and chemical resistance of glass
- **Excellent RF performance**, due to low dielectric constant of glass and highly conductive via materials
- **Optical transparency** of glass enables better processing and quality control during the production process of a MEMS device
- **Anodic bonding** with Silicon is feasible

### Technical data of wafer

Wafer thickness	500-1.600 $\mu\text{m}$ $\pm 20\mu\text{m}$
Wafer size	4", 6", 8"
Via pitch	min. 400 $\mu\text{m}$
Via diameter	80 $\mu\text{m}$
Via materials	<b>Tungsten (W)</b> – combined with BOROFLOAT <sup>®</sup> 33 (upon request: AF 32 <sup>®</sup> eco)
Hermeticity	Leak rate $\leq 1 \times 10^{-9}$ Pa · m <sup>3</sup> /s, [ $\leq 1 \times 10^{-8}$ mbar l/s]

### Technical data of glass

Glass material	BOROFLOAT <sup>®</sup> 33	AF 32 <sup>®</sup> eco 33
Coefficient of thermal expansion (CTE)	$3.25 \times 10^{-6}/\text{K}$ (match to Si)	$3.2 \times 10^{-6}/\text{K}$ (match to Si)
Dielectric constant @ 1MHz	4.6	5.1
Refractive index (@ 600 nm)	1.47	1.51



## Advantages compared to Ceramic Packaging

### Advantages of working with SCHOTT

#### Strong know-how in hermetic sealing and special glass

- SCHOTT is an expert for hermetic glass-to-metal sealing since 1941.
- SCHOTT is one of the leading developers and manufacturers of specialty glass with a 130 year history

SCHOTT HermeS<sup>®</sup> enables extremely miniaturized Chip Size Packaging since the Through Glass Vias can be directly attached to the silicon MEMS.

This results in:

- ~ 80% foot print reduction compared to ceramic package
- ~ 35% volume reduction compared to ceramic package