

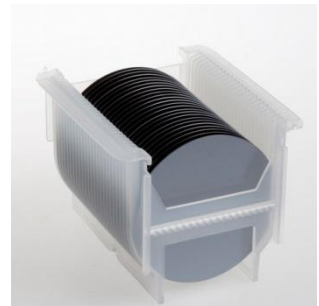


### **Solutions for low loss microwave and millimeter wave components**

Low-loss, high performance microwave and millimeter wave components are key parts of emerging high reliability telecommunication systems. In these systems, low loss and high performance is essential for keeping signal-to-noise ratios at acceptable levels and for maintaining efficient power management. Another important parameter is to meet the cost requirements of the total system. This is best achieved by using high resistivity (HiRes™) silicon substrates where technology is mature and substrate prices are attractive in comparison to traditional microwave and millimeter wave substrates such as quartz, ceramics and III-V semiconductors.

Typical devices that will benefit from using HiRes™ silicon are:

- GHz & THz applications
- RF MEMS switches
- High-Q inductors and capacitors
- GHz Transmitter and receiver circuits
- GHz mixers
- GHz Power amplifiers
- Low loss microstrip transmission lines and coplanar waveguides
- Micromachined thin Film Bulk Acoustic Resonators (FBAR)
- RF LDMOS and BiCMOS devices
- Millimeter-wave attenuators



Topsil is the world leading supplier of high resistivity HiRes™ silicon for a number of applications. Focus on R&D has resulted in products with the highest resistivities ever measured on silicon wafers. This - combined with more than half a century of experience in the production of float zone material and state-of-the-art wafering equipment - makes HiRes™ silicon wafers an excellent choice for a low-loss substrate for microwave frequencies.

Topsil offers standard Float Zone HiRes™ material with the listed parameters. Other parameters than those in the table are available upon request.

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| Growth method                   | HiRes™ Float Zone Silicon                     |
|---------------------------------|-----------------------------------------------|
| Resistivity                     | >1 kΩcm (max resistivity 50 kΩcm)             |
| Resistivity tolerance           | ±30 - ±50%                                    |
| Radial resistivity variation    | <50 - <60%                                    |
| Diameter                        | 150-200 mm                                    |
| Crystal orientation             | <100>, <111>*                                 |
| Type and Dopant                 | N, P: Undoped                                 |
| Oxygen and Carbon concentration | <10 <sup>16</sup> cm <sup>-3</sup>            |
| Wafer thickness                 | >200-1300 μm depending on wafer diameter      |
| Wafer surface finish            | Single side polished and double side polished |

\*200 mm <111> not available.

## Topsil GlobalWafers A/S

Topsil is a world leading supplier of ultrapure silicon for the global semiconductor industry. Engaging in long term relations with customers, Topsil focuses on premium quality, an efficient production process and a safe delivery of products.

Float-Zone FZ silicon is the high-purity alternative to crystals grown by the Czochralski CZ method. Based on extensive knowledge, expertise and significant investments in new technology, facilities and equipment, Topsil FZ silicon products are ideal for the most demanding purposes in conversion and control of electrical power.

Topsil was founded in 1959. Situated near Copenhagen, Denmark, Topsil is part of the GlobalWafers Group with manufacturing presence in Europe, Asia and the US.

### **Topsil GlobalWafers A/S**

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