

PRODUCT NOTE

**SNTD - ENHANCED NEUTRON  
TRANSMUTATION DOPED  
SILICON FOR DEMANDING  
POWER APPLICATIONS**

Neutron Transmutation Doped (NTD) silicon has the lowest resistivity variation of any crystalline silicon product on the market. This is of paramount importance for high power semiconductor devices to guarantee performance. The record low resistivity variations ensure safe and predictable voltage breakdown and forward current operating limits for these critical components.

Thyristors, Diodes and Solid State Transistors all rely on resistivity uniformity of the basis material over large areas. By use of neutron transmutation doping (NTD process) on undoped float zone silicon,  $Si^{30}$  isotopes can be transformed into n-type dopants in the form of Phosphorus,  $P^{31}$  resulting in a uniform radial dopant distribution.

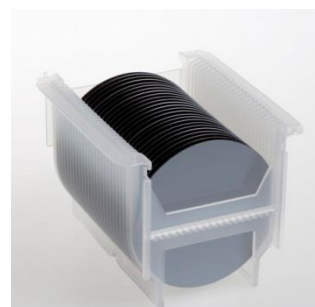
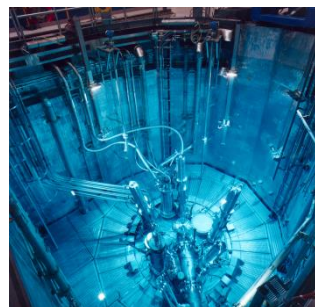
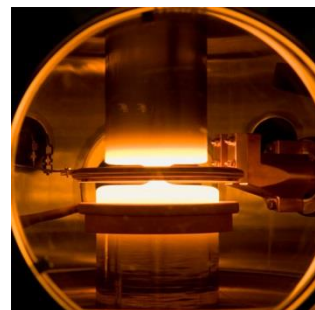
Topsil is market leading supplier of NTD silicon for demanding power applications. This position has been earned through a continuous focus on NTD and enhancements of product capabilities since Topsil co-invented the NTD-process in the 1970s.

The NTD silicon has premium technical properties and offers resistivity stability in production processes from the highest through the lowest resistivity range.

In 2017, Topsil introduces the new enhanced NTD silicon product called SNTD silicon. SNTD silicon sets a new market standard for resistivity uniformity across a wafer, also known as RRV (Radial Resistivity Variation), with a guaranteed limit of 2% for all wafers cut from one ingot

Topsil is supporting customers with SNTD products in the widest range of resistivity from 20  $\Omega$ cm to 800  $\Omega$ cm. Key properties for the SNTD product are:

- Lowest radial resistivity variation of any silicon crystalline product
- Tightest resistivity tolerance of any silicon crystalline product
- Low levels of performance degrading impurities
- High minority carrier lifetime





**CONTACT**

For more information please contact:

Senior Scientist  
Leif Jensen  
+45 26 83 56 63

lej@topsil.com

The standard parameters for Topsil SNTD silicon wafers are listed below. Other product parameters are possible upon request.

Growth method	Neutron Transmutation Doped Float Zone Silicon
Bulk resistivity range	20-800 Ωcm
Resistivity tolerance	±5%
Radial resistivity variation (ASTM F81 planC)	<2%
Striations	Not detectable
Minority carrier lifetime	>300 μs depending on bulk resistivity
Ingot diameter	200 mm
Crystal orientation	<100>
Type and Dopant	N (phosphorous)
Oxygen concentration	<1.0 10 <sup>16</sup> cm <sup>-3</sup>
Carbon concentration	<1.5 10 <sup>16</sup> cm <sup>-3</sup>
Wafer thickness	>200 μm
Wafer surface finish	As-cut, Lapped, Etched, Grinded, Polished

## Topsil GlobalWafers A/S

Topsil is a world leading supplier of ultrapure silicon to 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.

Silicon is used in electronic components to aid conversion and control of electrical power. Topsil provides ultrapure silicon mainly for the most demanding purposes, based on extensive knowledge and significant investments in new technology, facilities and equipment.

Headquartered in Copenhagen Cleantech Park, Topsil spans production sites in Denmark and Poland and sales locations in Europe, Asia and the US. Topsil is publicly listed at the Nasdaq OMX Copenhagen stock exchange and was founded in 1959.

**Topsil GlobalWafers A/S**

Siliciumvej 1  
DK-3600 Frederikssund  
Denmark  
Tel.: +45 47 36 56 00  
Fax: +45 47 36 56 01  
E-mail: [topsil@topsil.com](mailto:topsil@topsil.com)

Internet: [www.topsil.com](http://www.topsil.com)  
CVR no.: 24 93 28 18