



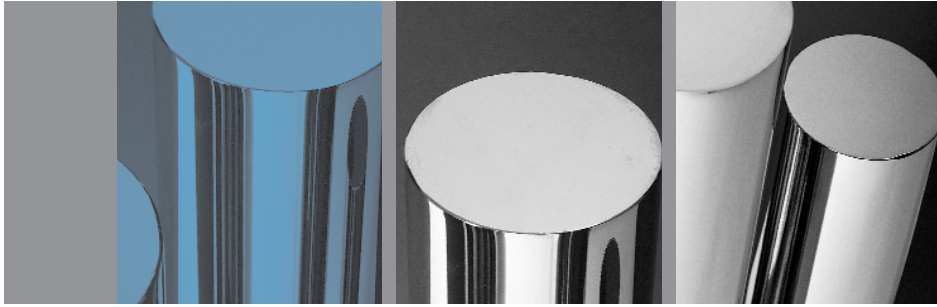
PRIME SILICON WAFERS FOR MEMS APPLICATIONS

- wafer solutions for leading-edge technology development

MEMS components are being widely used in a variety of systems ranging from low volume sensoric elements in harsh industrial environments to high volume consumer goods. MEMS is forecasted to impact on almost every product category bringing together silicon based microelectronics and micromachining technology in the same package or on the same chip. MEMS components require superior mechanical properties of the base silicon material. Topsil have more than 40 years of experience in growing silicon crystals and manufacturing silicon wafers from these crystals. Topsil fulfill the crystal and the wafering requirements from all part of the electronics industry and can offer high quality Czochralski and Float Zone silicon MEMS wafer products.

Topsil has specialized in growing Float Zone crystals with superior control of dopant content and distribution and with very low levels of contaminants. This is especially beneficial for applications requiring very low concentrations of oxygen such as powerMEMS components, high efficiency microstructured solar cells and photodiodes as well as rf MEMS devices on high resistivity silicon.

To complete Topsil range of products within MEMS, Topsil is also offering Czochralski wafers. Czochralski wafers are traditionally being used in MEMS applications with focus on the mechanical parameters and not on the bulk properties of the silicon. Most applications require low oxygen content, but a limit of 18 ppma (new ASTM) is sufficient in many cases. Most of the high volume components such as MEMS accelerometers and MEMS microphones are build on Czochralski wafers with superior mechanical wafer characteristics.



Topsil Semiconductor Materials A/S
 Linderupvej 4
 3600 Frederikssund, Denmark
 Telephone: +45 47 36 56 00
 Telefax: +45 47 36 56 01
 E-mail: topsil@topsil.com
 CVR-No. 24932818

Topsil offer Float Zone and Czochralski MEMS wafer substrates with the listed parameters. Other parameters than those in the table are possible on request.

Growth method	Czochralski	Float Zone
Diameter	50-150 mm	
Crystal Orientation	<100>, <111>	
Orientation Accuracy	< 0.5°	
Type and Dopant	undoped, n and p-type	
Dopant	Phosphorous, Boron	
Bulk resistivity	1-100	1-30000
Oxygen concentration (new ASTM)	< 18 ppma	< 0.02 ppma
Bulk lifetime	> 20 μ s	> 1000 μ s
Wafer thickness	200-1300 μ m	
Wafer thickness tolerance	\pm 5 μ m	
TTV	< 2.5 μ m	
TIR	< 1 μ m	
Wafer surface finish	Single side polished and Double side polished	

Topsil collaborates and interacts with universities and research laboratories involved in MEMS device fabrication, studying the behaviour of wafer properties (electrical and mechanical) under different MEMS processing conditions. Topsil have focus on high efficiency silicon solar cells and have used MEMS technologies on prime MEMS wafers to demonstrate 8 cm² solar cells with efficiencies above 20%. The prime wafers have low TTV and good crystal orientation that allow masking linewidths down to 5 μ m for a-through-wafer etch using only standard masking alignment systems.