

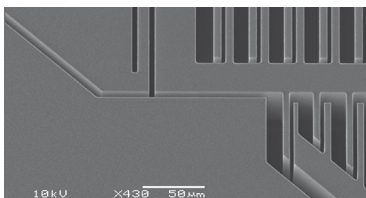
## Magelan

# High Performance Capacitive Inertial MEMS Technology Platform

### SECURED DEVELOPMENT AND RAMP-UP FOR INERTIAL SENSORS

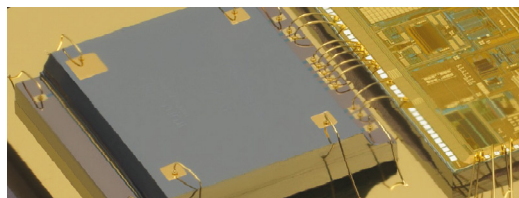
Based on 2 decades of experience in inertial MEMS components manufacturing, Tronics offers a proven and state-of-the-art inertial MEMS technology platform for high performance automotive, industrial and aerospace sensors. This innovative technology platform, called Magelan technology, offers an open foundry model with established design kit and layout services, supported by certified automotive quality standards (IATF 16949:2016 quality systems and AEC-Q100 reliability tests). The Magelan technology features hermetic / vacuum Wafer Level Packaging (WLP) enabling side by side or stacked die wire bonding assembly with integrated circuit, as well as the integration of up to 6 axis of measurement on a single chip (3 axis Accelerometer + 3 axis Gyro).

### UNIQUE THICK-SOI PROCESS WITH HERMETIC / VACUUM WLP



- 60 or 80  $\mu\text{m}$  thick single crystal silicon
- High aspect ratio DRIE up to 1:30
- Stiction-free cavity SOI process
- Patented Vacuum WLP <10mTorr with getter
- 2 metal layers for electrodes and routing with wire crossing on cap wafer
- Narrow seal ring enabling small die size and low cost
- Lateral vias and pads for standard wire bonding assembly with ASIC
- 100% static and dynamic test (frequency and Q-Factor)
- AEC-Q100 Reliability tests passed

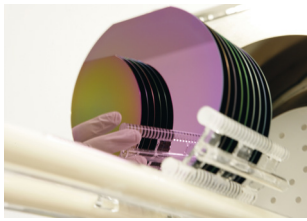
### FOR HIGH PERFORMANCE ACCELEROMETERS & GYROS



- From single axis to multi-axis inertial sensors
- Open or closed loop structures
- X and Y capacitive sensing and electrostatic driving through interdigitated combs
- Z sensing through metal electrodes on cap
- Thick proof mass for high signal to noise ratio
- Low parasitic capacitance
- High Q factor >20 000 with long term stable vacuum <10mT (e.g. for gyros and geophones)
- Damped microstructure with atmosphere pressure (e.g. for accelerometers)
- High reliability and shock resistance

### PROVEN PLATFORM FOR INERTIAL SENSING ELEMENTS

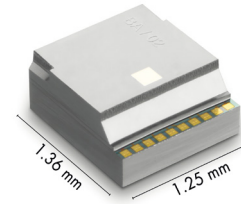
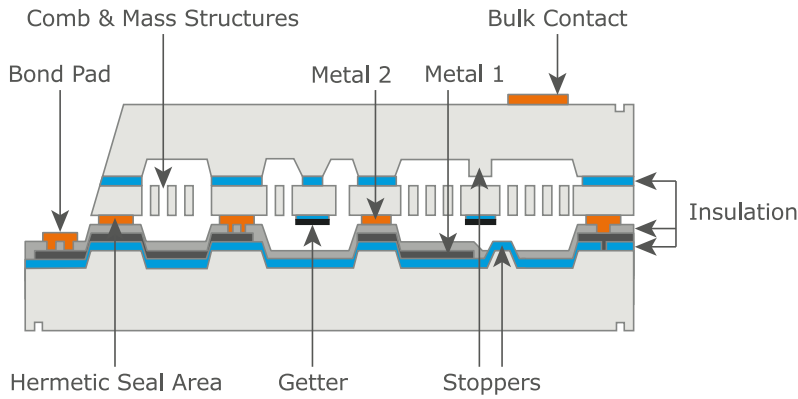




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## PROCESS SCHEMATIC



## TECHNICAL SPECIFICATIONS

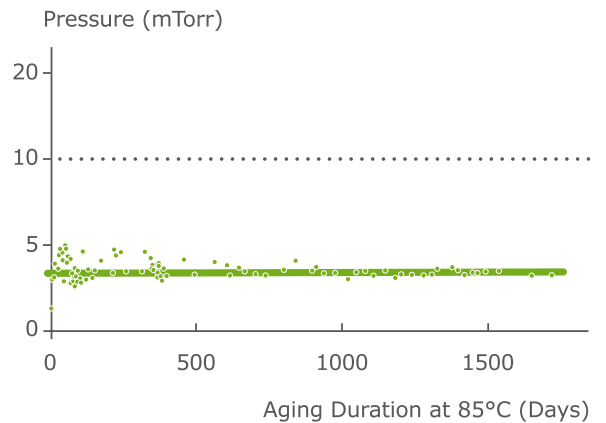
### Main geometrical and electrical parameters

Parameter	Typical value	
Die thickness	800 $\mu\text{m}$	
Seal width	150 $\mu\text{m}$	
SOI thickness*	60 $\mu\text{m}$	80 $\mu\text{m}$
Gap width	2.5 $\mu\text{m}$	3 $\mu\text{m}$
Spring width	4 $\mu\text{m}$	5 $\mu\text{m}$
Silicon resistivity	5-10 $\text{m}\Omega\cdot\text{cm}$	
Pad parasitic capacitance (80*80) $\mu\text{m}^2$	0.1 pF	
Sheet resistance M1 ; M2	1.5 $\Omega/\square$ ; 0.05 $\Omega/\square$	
Contact resistance M1-M2	0.1 $\Omega/\text{via}$	
Contact resistance M2-SOI	10 $\Omega/\text{via}$	

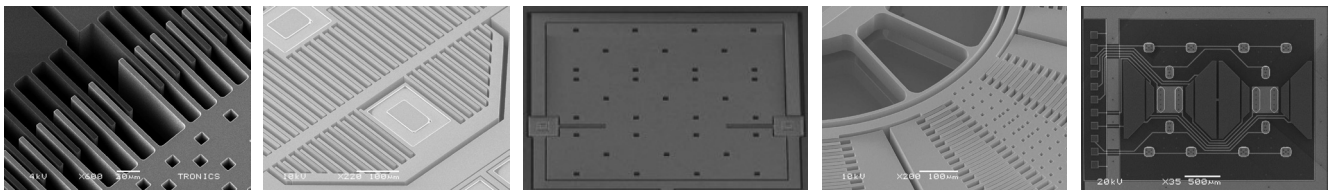
\* Other thicknesses available upon request

### Vacuum wafer level packaging hermeticity

Long term reliability data in temperature aging



## EXAMPLES OF DESIGNS ON MAGELAN PLATFORM



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