Ultrasonic Sensor Disks

Touchless Sensing

TDK Electronics AG
Piezo and Protection Devices Business Group
Product Marketing PTC Thermistors
Munich, Germany
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Production plants

Šumperk, Czech Republic
Front-end, back-end
- Pressing
- Sintering
- Metalization
- Poling
- Electric Inspection
- AOI
- Outgoing Inspection

Deutschlandsberg, Austria
Powder
- Powder production
Description of piezoelectric effect

- **Direct**: Pressure → voltage
  - Diagram showing pressure application to a disk and the resulting voltage output.

- **Indirect**: Electric field → Expansion / contraction
  - Diagram showing electric field applied to a disk and the resulting expansion or contraction.

**Ultrasonic sensor disk**

- Diagram of an ultrasonic sensor disk emitting sound waves.
Ultrasonic sensor disks technology advantages

- Touchless sensing
- Emitting and sensing of ultrasonic waves possible
- Compact dimensions
- Usable for gases, liquids and for bulk materials
Company advantages ultrasonic sensor disks

- Customer specific geometries available
- Strong customer support during development
- Electrode shape with superior adhesion force
- Metalization process with superior product quality
- Allowing both contacts on the same side
- Production certified to automotive standards IATF 16949
# Ultrasonic sensor disks portfolio

<table>
<thead>
<tr>
<th>Part number</th>
<th>B59070Z0285D12*</th>
<th>B59050Z0206A030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diameter [mm]</strong></td>
<td>7.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Thickness [mm]</strong></td>
<td>0.195</td>
<td>1.02</td>
</tr>
<tr>
<td><strong>Serial resonance frequency [kHz]</strong></td>
<td>285</td>
<td>2000</td>
</tr>
<tr>
<td><strong>Capacitance [pF]</strong></td>
<td>2000</td>
<td>300</td>
</tr>
</tbody>
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Ultrasonic sensor disks oscillation modes

Radial oscillation modes
Thickness oscillation
Higher harmonic of thickness oscillation

Frequency f [MHz]
Automotive applications for ultrasonic sensor disks

- Blind spot assist systems
- Park assist systems
- Anti-theft systems
- Level sensing in SCR or fuel tanks
Industrial applications for ultrasonic sensor disks

- **Level sensing systems for fluids or bulk materials in silos**
- **Flow metering systems in gas or fluid tubes**
- **Collision avoidance systems in industrial transport robots**
# Checklist of design inputs

<table>
<thead>
<tr>
<th>Mechanical parameters</th>
<th>Electrical parameters</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (Dxth)</td>
<td>Operating voltage (min, max)</td>
<td>Application medium (gas, fluid, bulk material)</td>
</tr>
<tr>
<td>Contact method</td>
<td>Operating current (min, max)</td>
<td>Packaging</td>
</tr>
<tr>
<td>Contact material</td>
<td>Preferred serial resonance frequency</td>
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</tr>
<tr>
<td>Preferred electrode</td>
<td>Preferred capacitance</td>
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