Electronic Substrates Overview
Thin-Film & Thick-Film Ceramic Substrates
WHY COORSTEK?

CoorsTek is the leader in ceramic substrates for thin-film and thick-film electronics, providing over a dozen substrate types optimized for a variety of processes and applications. Applying our deep expertise in advanced technical ceramics, CoorsTek engineers ceramic materials and substrate processing specifically to the rigorous demands of today’s thin-film and thick-film technology.

Thin-Film Ceramic Substrates

CoorsTek thin-film alumina substrates are optimal for most of today’s high-reliability thin-film electronics applications. By precisely controlling surface finish, grain size, and surface imperfections, CoorsTek substrates enhance fine-line resolution, spacing, and yield in your thin-film process.

SuperStrate® ceramic substrates are the industry standard for high performance, thin-film substrates — providing an exceptionally smooth surface finish for ultra-fine line geometries and outstanding adhesion bond strengths.

MidFilm® Ceramic Substrates

Exclusive CoorsTek MidFilm ceramic substrates provide excellent high-frequency performance using etchable ink and photo-formed electronic processes — delivering strong economic value compared to thin-film deposition processes.

MidFilm substrates work exceptionally well with single and multi-layer circuit designs, filling the gap between thin-film deposition and thick-film processes for applications from high-frequency microwave to photonics and multi-chip modules.

Thick-Film Ceramic Substrates

CoorsTek developed the standards for thick-film alumina substrates, engineered to provide durable and economical performance for hybrid integrated circuits (HIC), sensors, surface mount devices (SMD), and other thick-film electronics. These substrates minimize resistor variation while enhanced aged adhesion.

SUBSTRATE PROPERTIES BY FAMILY

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>THIN-FILM</th>
<th>MID-FILM</th>
<th>THICK-FILM</th>
<th>SPECIALTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Optimal thin-film performance</td>
<td>Industry standard for thin-film technology</td>
<td>Workhorse for most thin-film applications</td>
<td>Economical thin-film alternative</td>
</tr>
<tr>
<td>Applications</td>
<td>Ultra-fine line resolution &amp; spacing</td>
<td>Etchable ink &amp; photo-formed processing</td>
<td>Dark background LED displays</td>
<td></td>
</tr>
<tr>
<td>Surface finish</td>
<td>254 (10)</td>
<td>127</td>
<td>890 (35)</td>
<td>1140 (45)</td>
</tr>
<tr>
<td>Thickness range</td>
<td>26 (1)</td>
<td>&lt; 26 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size range</td>
<td>1.016 mm (0.040&quot;) to 1.43 mm (0.056&quot;)</td>
<td>1.43 mm (0.056&quot;) to 2.54 mm (0.100&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexural strength</td>
<td>682 (99)</td>
<td>572 (83)</td>
<td>440 (64)</td>
<td>400 (58)</td>
</tr>
<tr>
<td>Elastic Modulus</td>
<td>372 (54)</td>
<td>372 (54)</td>
<td>372 (54)</td>
<td>372 (54)</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>63 (8.2)</td>
<td>450 (67)</td>
<td>105 (15)</td>
<td></td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>20 °C</td>
<td>20 °C</td>
<td>20 °C</td>
<td>20 °C</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>650 (250)</td>
<td>600 (23)</td>
<td>22 (57)</td>
<td>22 (57)</td>
</tr>
<tr>
<td>Volume resistivity</td>
<td>25 °C</td>
<td>&gt; 10¹⁰</td>
<td>&gt; 10¹⁰</td>
<td>&gt; 10¹⁰</td>
</tr>
</tbody>
</table>

COORSTEK.COM
+1 303 271 7100
Specialty and Custom Substrates

Specialty Ceramic Substrates
Opaque Ceramic Substrates
For light-sensitive semiconductor devices, use CoorsTek opaque ADOS-90R — formulated specifically to block light transmittance and absorb stray light.

Medical Grade Ceramic Substrates
For medical applications, CoorsTek materials are USP Class VI certified.

Custom Substrates & Multi-Layer Structures
As a vertically-integrated leader in engineered ceramics and ceramic tape casting, CoorsTek has developed and produced substrates from more than two dozen materials.

CoorsTek also assembles complex multi-layer ceramic substrates that combine precision channels and features in laminated, hermetically sealed structures — providing high-purity, corrosion resistant “circuit” paths for fluids, gases, or air vacuum.

Customize Your Substrates
CoorsTek ceramic substrates are available in a wide variety of standard and custom thickness, shape, and size. A host of secondary processing options ensure substrates are configured just the way you need them.

<table>
<thead>
<tr>
<th>1” (25.4)</th>
<th>2” (51.0)</th>
<th>2.25” (57.15)</th>
<th>2.5” (63.5)</th>
<th>3” (76.2)</th>
<th>4” (101.6)</th>
<th>4.5” (114.3)</th>
<th>4.8” (121.9)</th>
<th>5.906” (150)</th>
</tr>
</thead>
</table>

Common substrate shapes and sizes (in inches and (mm)). Thick-film substrates available starting at 4.5” and larger.

Beyond providing the best selection of thin-film and thick-film ceramic substrate materials available, CoorsTek partners with you to customize substrates specifically for your application with a range of options:

- Thickness, size & shape
- “As-fired” and finished
- Surface lapping & polishing
- Laser machining & scribing
- Edge finishing
- Annealing
- Metallization & coating
- Precision tolerances
- Cleaning & inspection
- Subassembly & packaging
- Special quality certification (TS-16949, USP Class VI)

Substrate Design Guides
CoorsTek has developed specific, detailed design guidelines for configuring thin-film and thick-film substrates. Visit coorstek.com for a free download or contact a CoorsTek representative for more information.

About CoorsTek
CoorsTek is the leading global manufacturer of technical ceramics. With over 400 advanced material formulations and numerous state-of-the-art forming, firing, and finishing options, CoorsTek provides solutions to engineering challenges in electronics, automotive, semiconductor, and other industries. Locations worldwide. Visit www.coorstek.com

Consult with CoorsTek Engineers
CoorsTek engineers are available to help you select the optimal material and configure substrate options for your next electronics project. Schedule a consultation now.