Introduction

GORE® SMT EMI Gaskets and Grounding Pads, Supersoft Series solves many grounding and shielding challenges in automotive electronics by delivering exceptional EMI protection with easy SMT integration. The patented design ensures a large conformable contact area with the mating surfaces for low DC resistance grounding and reduces the likelihood of enclosure surface abrasion and particulation throughout the vehicle service life.

In addition, these off-the-shelf components reduce total costs because they are compatible with surface mount technology (SMT) and can be easily integrated into existing production lines. This eliminates the need for expensive custom designs and secondary processing.

W. L. Gore & Associates, Inc. (Gore) has developed the following guidelines for selecting, storing, and installing the Supersoft Series to ensure easy integration into your designs and manufacturing processes. Please be sure to confirm the suitability and usability of the Supersoft series in the intended application. For assistance in selecting the right component for your specific application, please contact a Gore representative.

Application Considerations

The Supersoft Series can be used for grounding in discrete locations, or to create a Faraday cage for EMI shielding. This eliminates the need for different types of components to solve various design challenges. Unlike custom configured gaskets and contacts, the Supersoft Series is easy to install on a printed circuit board (PCB) because they can be applied with standard SMT equipment.

If you are using the components for board-level shielding, they must be configured around the radiating element or PCB section to provide effective EMI shielding. Please consider important aspects of the design such as component orientation with respect to the radiating element, as well the spacing between components to achieve desired shielding effectiveness.

Benefits of GORE® SMT EMI Gaskets and Grounding Pads, Supersoft Series

- Large conformable contact area for low DC resistance throughout vehicle service life due to patented construction
- Reduced electromagnetic interference (EMI) and crosstalk in challenging environments
- Reduced likelihood of enclosure surface abrasion and particulation
- Increased design flexibility and reduced total costs with easily integrated standard parts versus custom designs
- Faster production rates because of consistent and repeatable assembly with SMT-compatible parts
Mechanical Design Considerations

When integrating the Supersoft Series into a design, there are several key factors to consider to ensure maximum performance.

Part Dimensions

The patented construction of the Supersoft Series includes a conformable gasket mechanically attached to a solderable shim (Figure 1). Part dimensions of the Supersoft Series include the total part length, width, and thickness of the gasket, shim, and mechanical crimp. See Table 1 for the nominal overall dimensions of each component, including corresponding typical weight.

Figure 1: Construction of Supersoft Series

Table 1: Nominal Dimensions and Weight of Supersoft Series

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Overall Length (mm)</th>
<th>Overall Width (mm)</th>
<th>Overall Thickness (mm)</th>
<th>Typical Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25SMT-4442-01</td>
<td>3.56</td>
<td>1.79</td>
<td>1.66</td>
<td>0.020</td>
</tr>
<tr>
<td>25SMT-4442-03</td>
<td>3.58</td>
<td>2.57</td>
<td>2.42</td>
<td>0.037</td>
</tr>
</tbody>
</table>

Recommended Compression

The Supersoft Series is engineered to maintain conductivity in a wide range of compressed heights (gap distances). Specific application requirements depend on the following criteria:

- Amount of force available
- Physical properties of the housing

In addition, the mating surface area of the housing should be equivalent to or larger than the top area of the Supersoft Series to ensure consistent contact. Gore also recommends integrating a compression stop to ensure consistent contact. The amount of space you are trying to fill (i.e., gap) determines the compressed height. The part numbers for the Supersoft Series have different recommended compressed height ranges (Figure 2). The combined compressed height should include the Supersoft Series component and the solder in your design.

Figure 2: Recommended Compressed Part Heights for Supersoft Series

Galvanic Compatibility and Corrosion

When using the Supersoft Series, designers should carefully consider galvanic compatibility. The conductive contact surface of the Supersoft Series contains silver and may result in corrosion when in contact with mating surfaces that contain dissimilar metals. However, the Supersoft Series has been successfully installed in applications that contain aluminum alloys and metalized plastics (i.e., ABS/polycarbonate). Since corrosion is a complex process influenced by the environment and time, designers should perform testing in the intended application to confirm galvanic compatibility of the materials.
Printed Circuit Board (PCB) Design

When integrating the Supersoft Series into a board-level design, there are several key factors to consider to ensure maximum performance.

Board Layout

The orientation and spacing in between the components impacts shielding effectiveness, which is particularly important if you are using components to create a Faraday cage or EMI shield in your application. Gore has performed EMI shielding effectiveness testing and recommends using the Supersoft Series in a parallel orientation relative to the radiating element for maximum performance (Figure 3). Please note that performance is impacted when components are used in a perpendicular orientation.

Figure 3: Parallel Orientation of Supersoft Series

When placing the Supersoft Series on a PCB, the recommended minimum distance is five (5) millimeters (mm) from the board edge, especially when the board is singulated using a depanelizer. Components may be spaced very close together if desired; however, they should not touch each other.

Recommended Solder Pad/Mask Opening

The recommended length and width of the solder mask opening is approximately 10 percent greater than the width of the component (Figure 4). For example, a component that is 1.79 mm wide should have a solder mask opening of 1.97 mm allowing for a small solder fillet to form between the ground trace and the shim. Refer to the recommended solder mask opening dimension by specific component number (Table 2).

Figure 4: Recommended Solder Mask Opening

Table 2: Solder Mask Opening Dimensions for Supersoft Series

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Recommended Length (A) (mm)</th>
<th>Recommended Width (B) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25SMT-4442-01</td>
<td>3.92</td>
<td>1.97</td>
</tr>
<tr>
<td>25SMT-4442-03</td>
<td>3.94</td>
<td>2.83</td>
</tr>
</tbody>
</table>

Recommended Solder and Paste Laydown Dimensions

The Supersoft Series are typically compatible with both tin-lead and lead-free solder alloys and related processes. Gore has also performed testing using industry standard test method EIA/IPC/JEDEC J-STD-002 — Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires. Test results successfully confirmed the solderability of the Supersoft Series. It is also recommended to use a no-clean paste and process with the Supersoft Series. For more information on cleaning process recommendations, see the section on Solvents and Cleaning Processes Guidelines.
The recommended solder pattern for the Supersoft Series should be either circles or rectangles evenly distributed under the component (Figure 5). The geometry of the specific component determines the dimensional area and quantity of solder paste pads (Table 4). Either pattern allows for a sufficient volume of solder without flooding the ground trace with excess solder. In addition, this minimizes rotation or lateral movements of the components during reflow on ground traces that are wider than recommended. The recommended solder paste laydown is a thickness of 0.127 mm (0.005 inches). Gore recommends performing additional testing if using a solder paste laydown that is less than the recommended thicknesses to ensure adequate volume in the ground trace.

Figure 5: Solder Paste Pattern

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Quantity</th>
<th>Recommended Diameter (C) (mm)</th>
<th>Recommended Pad Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25SMT-4442-01</td>
<td>2</td>
<td>1.02</td>
<td>0.127</td>
</tr>
<tr>
<td>25SMT-4442-03</td>
<td>2</td>
<td>1.50</td>
<td>0.127</td>
</tr>
</tbody>
</table>

Table 4: Solder Paste Laydown for Supersoft Series

**Solder Reflow**

The Supersoft Series can be easily integrated into most typical solder reflow profiles without special considerations (Figure 6). These components can withstand up to three (3) reflow cycles without a reduction in performance. Gore has successfully tested the components at a maximum reflow temperature of 260°C for up to 30 seconds (Table 5). If using components at higher temperatures or for longer durations, Gore recommends performing testing to validate acceptable performance at the intended reflow conditions.

**Moisture Sensitivity Level (MSL)**

Gore also performed testing using industry standard test method IPC/JEDEC J-STD-020 — Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices. Results showed that the Supersoft Series is classified as MSL-1 (Moisture Sensitivity Level) unlimited floor life. These components do not require any special pre-treatment or soak requirements before reflow steps even after one year once removed from the secondary packaging.
Production Considerations

When integrating the Supersoft Series into a manufacturing production line, there are several key factors to consider to ensure maximum performance.

Tape and Reel Configuration

The Supersoft Series is packaged in the carrier tape with the metal shim at the bottom of the pocket (Figure 7). Therefore, re-orientation is not required before placing the component on the PCB.

Figure 7: Part Orientation of Supersoft Series in Carrier Tape Pocket

All components of the Supersoft Series, including the carrier tape, cover tape and reels are packaged in alignment with the applicable sections of ANSI/EIA-481 — 8 mm Through 200 mm Embossed Carrier Taping and 8 mm & 12 mm Punched Carrier Taping of Surface Mount Components for Automatic Handling. The carrier tape is constructed of black polycarbonate that is carbon filled to provide protection against electrostatic discharge (ESD). The components are packaged in a 4-mm pitch carrier tape with a tape width of 12 mm (Figure 8). The $A_0$, $B_0$, and $K_0$ pocket dimensions (Figure 9) vary based on the part dimensions as shown in Table 6.

Table 6: Tape and Reel and Shipping Configuration

<table>
<thead>
<tr>
<th>Gore Part Number</th>
<th>Carrier Tape Configuration (mm)</th>
<th>Pocket Dimensions</th>
<th>Parts Per Reel</th>
<th>Reels Per Shipping Box (Max)</th>
<th>Typical Shipping Box Weight (lbs Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25SMT-4442-01</td>
<td>12 x 4</td>
<td>$A_0$ (mm) $B_0$ (mm) $K_0$ (mm)</td>
<td>6,500</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>25SMT-4442-03</td>
<td>12 x 4</td>
<td>1.95 3.95 1.81</td>
<td>6,500</td>
<td>20</td>
<td>28</td>
</tr>
</tbody>
</table>

Gore uses cover tape that is designed not to extend over the edge of the carrier tape or cover any part of the sprocket holes. The cover tape is constructed of transparent, static-dissipative plastic with a pressure sensitive adhesive (PSA) zone. The measured peeling force of the cover tape is between 10 and 130 grams (0.1 N to 1.3 N).

Gore uses reels that fit the 12-mm tape size and have a 100-mm maximum hub diameter with a 330-mm maximum outside diameter (Figures 10 and 11). The inside diameter has three (3) drive spokes with a minimum diameter of 20.2 mm. The bar code labels are on the side of the reel opposite the round sprocket holes. Reels are packaged into shipping boxes, and the number of reels per carton varies depending on the order quantity as referenced in Table 6.
The Supersoft Series is designed to be installed by standard SMT equipment for easy integration into manufacturing lines. These components are compatible with pick-and-place equipment that accepts 12-mm tape and reel vacuum pickup. Gore has successfully tested the placement of the components as low as 0.1 seconds. The nozzle’s inner diameter should not exceed the width of the component to ensure reliable vacuum. Gore recommends a standard nozzle with one (1) opening over a custom nozzle with multiple openings.

Gore also recommends using tape and reel feeder mechanisms that have very small clearances with the Supersoft Series. If the openings or clearances are too large, the carrier tape can vibrate and move, causing the components to move inside the pockets after the cover tape is removed. In addition, when handling the populated boards or storing them in trays between process steps, be careful to avoid applying horizontal force to the Supersoft Series on the PCB to avoid damaging the component.

**Solvents and Cleaning Process Guidelines**

Gore recommends using a no-clean paste and process with the Supersoft Series. If cleaning is required, Gore recommends using water or cleaning solvents that are chemically compatible with silicone. Gore does not recommend using high-pressure cleaning processes or angular jets imparting lateral forces on the components.

For questions regarding compatibility of your cleaning operation with the Supersoft Series, please contact a Gore representative.

**Manual Soldering and Rework**

Since the Supersoft Series is compatible with high-temperature reflow processes, they can be manually soldered to the ground trace if necessary. Gore recommends the following guidelines to ensure successful placement:

- Avoid direct contact of the components with the soldering iron or other heat sources
- Be sure to ventilate the area properly
- Use the manual process in post-reflow operations only when pick-and-place issues have caused alignment, orientation or placement error of soldered components
- Always use a new component and do not re-use a component
Shelf Life and Storage Guidelines

Gore recommends storing the Supersoft Series in a controlled environment with ambient conditions in temperatures between 5°C to 30°C with 20 to 80 percent relative humidity. Gore maintains a shelf life of 2 years from the manufacturing date for the Supersoft Series. Note that long-term storage in uncontrolled conditions may affect the solderability and performance of the components.

Ordering Information and Samples

GORE® SMT EMI Gaskets and Grounding Pads, Supersoft Series for automotive electronics are available in standard sizes. Visit our website at gore.com/autoemi for more technical information, including a data sheet. Samples are also available in small tape and reel format (500-piece quantity) for easy integration into standard SMT equipment for product evaluation purposes.

To discuss your specific application needs or request samples for evaluation, contact a Gore representative.