Introduction

Durafuse™ LT is a novel solder paste mixed-alloy system for low-temperature reflow processes which require high drop shock reliability. Durafuse™ LT is made up of a low-melting Sn-containing alloy and higher-melting SAC alloy. The SnInAg alloy initiates joint fusion while the SAC alloy provides enhanced strength and durability. Durafuse™ LT is ideal for high-reliability applications, which utilize thermally sensitive components.

Features

- Excellent drop shock reliability—comparable to SAC
- Reflow below 210°C
- Melting temperature above 180°C
- Good mechanical shear strength up to 150–165°C
- Good thermal and electrical conductivity

Flux Vehicle

Indium5.7LT-1 is an air reflow, halogen-free, no-clean solder paste designed for assembly processes using Bi-based and In-containing low-temperature alloys. This paste is a clear residue product with exceptional wetting capabilities. The low activation temperature and high thermal tolerance of Indium5.7LT-1 enables a fully optimized reflow process.

Key Applications

Low-temperature solders reduce warpage of thermally sensitive components by reducing peak reflow temperature. However, standard Bi-based low-temperature alloys are unable to withstand even moderate drop shock. Durafuse™ LT is a low-temperature Pb-free solder capable of reducing peak reflow temperature by 40°C relative to SAC305, with drop shock reliability two orders of magnitude greater than standard low-temperature alloys.

Durafuse™ LT samples in the chart (left) experienced a peak reflow temperature of 210°C and demonstrated drop shock resilience similar to that of SAC305.

Storage and Handling Procedures

Refrigerated storage will prolong the shelf life of solder paste. Solder paste packaged in cartridges should be stored tip down.

Packaging

Standard packaging for Durafuse™ LT is 500g jars and 600g cartridges. Other packaging options may be available upon request.

Complementary Products

- Rework Flux: TACFlux® 020B-RC, TACFlux® 571HF
- Liquid Rework Flux: FP-500

Note: Other products may be applicable. Please consult one of Indium Corporation’s Technical Support Engineers.
PRODUCT DATA SHEET

Durafuse™ LT
Low-Temperature Drop Shock Solution

Printing

Stencil Design:

Electroformed and laser cut/electropolished stencils produce the best printing characteristics among stencil types. Stencil aperture design is a crucial step in optimizing the print process. The following are a few general recommendations:

- Discrete components—A 10–20% reduction of stencil aperture has significantly reduced or eliminated the occurrence of mid-chip solder beads. The “home plate” design is a common method for achieving this reduction.
- Fine-pitch components—A surface area reduction is recommended for apertures of 20mil pitch and finer. This reduction will help minimize solder balling and bridging that can lead to electrical shorts. The amount of reduction necessary is process-dependent (5–15% is common).
- A minimum aspect ratio of 1:5 is suggested for adequate release of solder paste from stencil apertures. The aspect ratio is defined as the width of the aperture divided by the thickness of the stencil.

Printer Operation:

The following are general recommendations for stencil printer optimization. Adjustments may be necessary based on specific process requirements:

<table>
<thead>
<tr>
<th>Solder Paste Bead Size</th>
<th>20–25mm in diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print Speed</td>
<td>25–100mm/second</td>
</tr>
<tr>
<td>Squeegee Pressure</td>
<td>0.018–0.027Kg/mm of blade length</td>
</tr>
<tr>
<td>Underside Stencil Wipe</td>
<td>Start at once per every 5 prints and decrease frequency until optimum value is reached</td>
</tr>
<tr>
<td>Solder Paste Stencil Life</td>
<td>&gt;12 hours (at 30–60% RH and 22–28°C)</td>
</tr>
</tbody>
</table>

Cleaning

Indium5.7LT-1 is designed for no-clean applications; however, the flux can be removed, if necessary, by using a commercially available flux residue remover.

Stencil Cleaning is best performed using an automated stencil cleaning system for both stencil and misprint cleaning to prevent extraneous solder balls. Most commercially available stencil cleaning formulations including isopropyl alcohol (IPA) work well.

Reflow

Recommended Profile:

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>1</td>
</tr>
<tr>
<td>180</td>
<td>2</td>
</tr>
<tr>
<td>210</td>
<td>3</td>
</tr>
<tr>
<td>220</td>
<td>4</td>
</tr>
<tr>
<td>240</td>
<td>5</td>
</tr>
<tr>
<td>250</td>
<td>6</td>
</tr>
<tr>
<td>260</td>
<td>7</td>
</tr>
</tbody>
</table>

This profile is designed for use with Durafuse™ LT in Indium5.7LT-1. This can be used as a general guideline in establishing a reflow profile for Durafuse™ LT Solder Paste. Deviations from these recommendations are acceptable, and may be necessary, based on specific process requirements.

Heating Stage:

A linear ramp rate of 1–2°C/second allows gradual evaporation of volatile flux constituents and prevents defects such as solder balling/beading and bridging as a result of hot slump. It also prevents unnecessary depletion of fluxing capacity.

Fusion Stage:

A plateau region between low- and high-temperature alloy liquidus temperatures facilitates alloy integration. Peak reflow temperature between 200–210°C is ideal to form an optimally fused solder joint. Peak temperatures below 200°C may fail to capture the full drop shock capability of Durafuse™ LT.

Cooling Stage:

A rapid cool down is desired to form a fine-grain structure. Slow cooling will form a large-grain structure, which typically exhibits poor fatigue resistance. The acceptable cooling range is 0.5–6.0°C/second (2–6°C/second is ideal).