Attention to counterfeit products.
Counterfeit flux core and other inauthentic SMIC solder products have been distributed abroad.
Please purchase genuine SMIC products from SMIC subsidiaries or authorized distributors.
**Solder Preform**

Solder Preform is pre-forms of solid solder alloys with potential to change the future. Combination of machining technologies such as rolling and pressing are used to process the solder alloy into various shapes, allowing the solder to be used effectively. With the evolution of the soldering process, SMIC has developed **ECO SOLDER PREFORM** that has various structures to help customer's innovation.

Contents

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- Solder Alloy Lineup 14
- Base Material Physical Properties for Solder Coated Metal

**Line up**

Promote various synergies by selecting from 6 shapes as well as from solder alloy composition and dimensions.

<table>
<thead>
<tr>
<th>Shape</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ribbon</td>
<td>Single Layered</td>
</tr>
<tr>
<td>Square</td>
<td>Ni Balls Contained</td>
</tr>
<tr>
<td>Disc</td>
<td>Flux Coated</td>
</tr>
<tr>
<td>Washer</td>
<td>Solder Coated Metal</td>
</tr>
<tr>
<td>Chip</td>
<td>Flux Coated</td>
</tr>
<tr>
<td>Wire</td>
<td>Double Layered</td>
</tr>
</tbody>
</table>

Custom shapes and dimensions are available for customer requirements.
Soldering methods for each shape

**Ribbon**
Wound in tape reels and can be cut into required lengths prior to mounting.
![Ribbon Image with specifiers]

**Square**
Fixed amount of solder is supplied to components within a predetermined tolerance range.
![Square Image with specifiers]

**Disc**
Processed into shapes to fit the components.
![Disc Image with specifiers]

**Washer**
Reliable heat sealing for areas where paste printing is difficult, preventing uneven heating.
![Washer Image with specifiers]

Minimum and maximum values may vary depending on the alloy composition.

To make other shape, customers’ design drawings and specifications will be required. Please contact us for more details.

Note) Various shapes and sizes can be made according to customer requirements.
Chip

Reinforces the area where the amount of solder is insufficient

- Unique pressing technique flattening all four bonding faces of the chips
- Automatic mounting possible with chip mouter
- Joint reinforcement of pin thru-hole components using reflow

Wire

Makes low-cost, high-quality die bonding a reality

- The wire method allowing soldering at a cheaper price than the preform method
- Fewer surface scratches and oxide film combined with good wettability making flux-free soldering possible
- Superb condition of the wire surface suppressing the formation of voids

Wettability and voids

<table>
<thead>
<tr>
<th></th>
<th>Surface condition of wires (SEM)</th>
<th>Wettability comparison (in reducing atmosphere)</th>
<th>Comparison of voids</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMIC products</td>
<td><img src="image1" alt="SMIC Surface SEM" /></td>
<td><img src="image2" alt="On-market excellent wettability" /></td>
<td>Void percentage: Less than 2%</td>
</tr>
<tr>
<td>On-market products</td>
<td><img src="image3" alt="On-market surface SEM" /></td>
<td><img src="image4" alt="On-market excellent wettability" /></td>
<td>Void percentage: Less than 5%</td>
</tr>
</tbody>
</table>
Single Layered

Solder Alloy Composition and Shapes for Customer’s Requirements

- Consistent solder joint quality in mass production with fixed shapes and quantity.
- Allows for flux-free soldering in inert atmospheres.
- Solder alloys with difficult process properties, such as those containing Bi and Sb, are available.

Shape

- Consistent solder joint quality in mass production with fixed shapes and quantity.
- Allows for flux-free soldering in inert atmospheres.
- Solder alloys with difficult process properties, such as those containing Bi and Sb, are available.

Applications

- Ideal for die bonding
  Ideal for die bonding where it is difficult to feed the solder and expecting to eliminate voids.

Ni Balls Contained

Ni Ball Spacer Function Improves Joint Reliability

- Ensures standoff to prevent cracking due to concentrated thermal stress.
- Flat layered structure improves wire bonding accuracy.

Shape

- Ensures standoff to prevent cracking due to concentrated thermal stress.
- Flat layered structure improves wire bonding accuracy.

Applications

- High-quality power modules
- Power module}

Performance / Lineup

- Spacer function of Ni balls
  Ni Balls Contained preform has nickel balls with a small particle size inside the preform. When soldering, it forms a standoff with the particle size of the Ni balls as the minimum to ensure the evenness of the soldering components.

Structure

Ni Balls Contained preform has nickel balls with a small particle size inside the preform. When soldering, it forms a standoff with the particle size of the Ni balls as the minimum to ensure the evenness of the soldering components.

Performance / Lineup

- Spacer function of Ni balls
  Ni balls suppress variations in solder thickness
**Flux Cored**

*Synergistic Effect of Preform and Flux*
- Fixed shapes and quantity while adding the functions of flux.
- Ideal for thru-hole soldering of connectors, discrete and metal components.
- Reduces production costs by switching from selective flow soldering.

*Structure*

**Flux Cored** preform has flux inside the preform. In addition to eliminating the flux application process, storage and handling are also easier due to the solid stability. Customers can choose alloys and flux according to the requirements and purposes.

*Applications*

- Assembling metal components
- Selective heat soldering of heat-sensitive components
- Thru-hole reflow soldering of inserted components

*Performance / Lineup*

Please refer to our [ECO SOLDER CORED product catalogue](#). Contact us for more information about other products.

**Flux Coated**

*Excellent Joints Even on Uneven Surfaces*
- Flux application is not necessary.
- Allows the paste to be applied to hard-to-apply uneven surfaces.

*Structure*

**Flux Coated** preform is the general-purpose preform which is evenly dry-coated with flux, eliminating the need of manual fluxing.

*Applications*

- Preforms
- Components
- Solder with reflow heating

*Select coating flux according to the purpose*

<table>
<thead>
<tr>
<th>Flux</th>
<th>Type</th>
<th>IPC classification</th>
<th>Applicable base material</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFC1</td>
<td>R</td>
<td>RDL0</td>
<td>Ni/Au plating, Ag, Cu, etc.</td>
</tr>
<tr>
<td>SFC2</td>
<td>Halogen free</td>
<td>RDL0</td>
<td>Ni/Au plating, Ag, Cu, etc.</td>
</tr>
<tr>
<td>SFC3</td>
<td>RMA</td>
<td>RDL1</td>
<td>Ni/Au plating, Ag, Cu, etc.</td>
</tr>
<tr>
<td>SFC4</td>
<td>RA</td>
<td>RDL1</td>
<td>Ni, brass, Cu, Sn, etc.</td>
</tr>
<tr>
<td>SFC5</td>
<td>RA</td>
<td>ROM1</td>
<td>Ni, brass, Cu, Sn, etc.</td>
</tr>
</tbody>
</table>

Please contact us about available flux types.
Solder Plated Materials

- Thick solder coating protects the base metal surface and ensures the solder feed.
- Base metal ensures the soldering standoff and improves its reliability.
- Molding technology enables supplying a variety of shapes.

Shape

Ensures sufficient solder

Replenish

Applying the Shapes, Dimensions, and Properties of Base Metal to Soldering

Solder Coated Metal can be used as composite solder joining components by forming a solder alloy layer on the surface of ferrous and non-ferrous base metals through a melt coating process and shaping it according to the purpose.

Structure

Applications

Performance

Double Layered

Integrating Materials with Different Properties to Develop New Joint Processing

- Solder alloys with different properties are laminated.
- Two-step soldering utilizing different melting temperatures.
- Optimal joint for electrodes with different surface materials.

Structure

Applications

Joining with optimum solder composition for bonding surface conditions

Surface treatment for identifying the composition of the surface

Surface treatment A
- Solder composition A
- Solder composition B
- Surface treatment B

Surface treatment for identifying the composition of the surface

Designed surface can be engraved

Cutoff fuses for temperature sensors

Alloys with different compositions and melting temperatures are made into a bimetal structure

Solder alloy B
- Solder alloy A

Joining with optimum solder composition for bonding surface conditions

Surface treatment A
- Solder composition A
- Solder composition B
- Surface treatment B

Surface treatment for identifying the composition of the surface

Designed surface can be engraved

Cutoff fuses for temperature sensors

Alloys with different compositions and melting temperatures are made into a bimetal structure

Solder alloy B
- Solder alloy A

Note) All products are tailor made. Please contact us when considering these products.
### Solder Alloy Lineup

<table>
<thead>
<tr>
<th>Alloy name</th>
<th>Alloy composition(wt%)</th>
<th>Melting temperature range °C</th>
<th>Structure of products</th>
</tr>
</thead>
<tbody>
<tr>
<td>M705</td>
<td>Sn-3.0Ag-0.5Cu</td>
<td>217 – 220</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M30</td>
<td>Sn-3.5Ag</td>
<td>221 – 223</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M31</td>
<td>Sn-3.5Ag-0.75Cu</td>
<td>217 – 219</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M34</td>
<td>Sn-1.0Ag-0.5Cu</td>
<td>217 – 227</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M20</td>
<td>Sn-0.75Cu</td>
<td>227 – 229</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M40</td>
<td>Sn-1.0Ag-0.7Cu-Bi-In</td>
<td>211 – 222</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M10</td>
<td>Sn-5.0Sb</td>
<td>240 – 243</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M14</td>
<td>Sn-10Sb</td>
<td>245 – 266</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M794</td>
<td>Sn-3.4Ag-0.7Cu-Bi-Sb-Ni-x</td>
<td>210 – 221</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M725</td>
<td>Sn-0.7Cu-Ni-P</td>
<td>228 – 230</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M314</td>
<td>Sn-3.8Cu-0.6Sb-0.8In</td>
<td>221 – 226</td>
<td>●●●●●</td>
</tr>
<tr>
<td>M16</td>
<td>Sn-3.5Ag-0.5Bi-0.8In</td>
<td>196 – 214</td>
<td>●●●●●</td>
</tr>
<tr>
<td>L20</td>
<td>Sn-58Bi</td>
<td>139 – 141</td>
<td>●●●●●</td>
</tr>
</tbody>
</table>

Please contact us for more information about other alloy composition.

- **M705**: 3% Ag general-purpose alloy with more than 20 years of experience
- **M794**: Heat & fatigue-resistant alloy for automotive applications
- **M314**: Heat & fatigue-resistant general-purpose alloy for automotive applications
- **M20**: Ag-free, Cu based general-purpose alloy
- **M10**: Sb based general-purpose alloy with a high melting point
- **L20**: Bi based general-purpose alloy with a low melting point

### Base Material Physical Properties for Solder Coated Metal

#### Nickel silver

<table>
<thead>
<tr>
<th>Metal base material</th>
<th>Metal No.</th>
<th>JIS Classification</th>
<th>Melting temperature (°C)</th>
<th>Composition</th>
<th>Tensile strength (N/mm²)</th>
<th>Elongation (%)</th>
<th>Vickers hardness (HV)</th>
<th>Young’s modulus (GPa)</th>
<th>Coefficient of thermal expansion (10⁻⁶/K)</th>
<th>Specific gravity (g/cm³)</th>
<th>Electrical conductivity (%IACS)</th>
<th>Thermal conductivity (20 °C) (W/m/K)</th>
<th>Specific heat (J/g/K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C7521</td>
<td>O</td>
<td>1110 (2030)</td>
<td>Zn-63Cu-18Ni</td>
<td>≧375</td>
<td>≧20</td>
<td>≧125</td>
<td>16 (20-300°C)</td>
<td>8.73</td>
<td>6</td>
<td>33</td>
<td>0.377</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7511</td>
<td>H</td>
<td>1110 (2030)</td>
<td>Zn-63Cu-18Ni</td>
<td>≧340</td>
<td>≧3</td>
<td>≧150</td>
<td>16 (20-300°C)</td>
<td>8.73</td>
<td>6</td>
<td>33</td>
<td>0.377</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7701</td>
<td>H</td>
<td>1083 (1981)</td>
<td>Zn-63Cu-18Ni</td>
<td>≧440</td>
<td>≧4</td>
<td>≧180</td>
<td>16 (20-300°C)</td>
<td>8.70</td>
<td>5.5</td>
<td>29</td>
<td>0.377</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1020</td>
<td>H</td>
<td>1083 (1981)</td>
<td>Zn-63Cu-18Ni</td>
<td>≧400</td>
<td>≧4</td>
<td>≧150</td>
<td>16 (20-300°C)</td>
<td>9.95</td>
<td>101</td>
<td>34</td>
<td>0.377</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1100</td>
<td>H</td>
<td>1083 (1981)</td>
<td>Zn-63Cu-18Ni</td>
<td>≧430</td>
<td>≧4</td>
<td>≧150</td>
<td>16 (20-300°C)</td>
<td>9.85</td>
<td>101</td>
<td>34</td>
<td>0.377</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above values are for reference only. Please contact us about materials not listed above.

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### Realization of fixed shape & quantity by low-temperature, Bi-based solder preform

**Typical composition**

**L20** *(Sn-58Bi)*

- **139 – 141°C**

Improving mass production stability for low-temperature soldering and effective for solder feeding methods to which solder pastes are difficult to apply.

**High-strength, Sb-based solder composition preforms allow for secure soldering of electronic power devices**

**Typical composition**

**M14** *(Sn-10Sb)*

- **245 – 266°C**

Supplying fixed quantity of high-strength solder ensures reliable soldering that can withstand severe environments such as those in automotive, industrial, and aerospace equipment.

**Power control system**

- Power control system
- Engine control system

**Drive control system**

- Power control system