

Low-Temperature Solder

Introduction

Traditional solders have reflow temperatures in the range of 183 to 221°C. However, advancements in components, substrates, and electronics design have driven the need for solder that will reflow in the 115 to 180°C range. Some of these key drivers include:

- Temperature sensitive components (i.e., plastic-capped MEMS or GaAs sensors)
- Substrates that deform, melt, or delaminate at higher reflow temperatures (i.e., 3D-MID plastics, fabrics, or flex circuits)
- Processes that require step-soldering
- Desire for lower reflow costs
- Mating parts that have significant difference in their coefficient of thermal expansion (CTE)
- Pb-free solders that reflow in the range of the traditional SnPb and SnPbAg options

Solder alloys in this temperature range are generally indium- or bismuth-based. Some of the more popular solders are shown in the table on the back of this sheet.

Solder Forms

Low-temperature solders are available in similar forms to traditional solders.

Solder paste

- NC-SMQ®80 for indium-containing
- Indium5.7LT for bismuth-containing
- Can be used in all standard stencil, printing, and dispense operations
- Flux vehicles still need to reach 170 to 180°C for full activation

Solid Wire

- Solid wire diameters starting at 0.010" (0.254mm)
- Exacting tolerances
- Oil-free

Spheres

- Consistently high sphericity
- Accurate diameters
- Available in tape & reel

Preforms

- Can be flux-coated
- Provide a controlled, repeatable solder volume for each insertion
- Available in custom sizes and thicknesses
- Packaging for automated and manual processes

Ribbon/Foil

- Custom widths and thicknesses
- Can be used for initial material evaluations

Contact our Application Engineering group for more information on the right alloy and form for your application.

Indium-Containing Solder

Choosing a solder that contains indium provides many advantages to other solder options:

- Excellent thermal conductivity (In=86W/mK)
- Compensates for differing thermal coefficients of expansion
- Can improve thermal fatigue
- Soft and malleable even at cryogenic temperatures
- Improved mechanical shock results compared to bismuth
- Pure indium is self-passivating so it forms only 80–100 angstroms of oxide on the surface
- InPb alloys reduces scavenging of gold on gold-plated surfaces (as compared to Sn)

Bismuth-Containing Solder

Although pure bismuth has a much higher melting temperature (271°C) than pure indium (157°C), when it is alloyed with tin, or tin and silver, it results in two of the more popular Pb-free, **low-temperature solders** (Indalloy®281 and Indalloy®282). Several Pb-containing alloys are also available. Features of bismuth-containing alloys include:

- Similar joint properties to SnPb solders with superior fatigue and copper dissolution characteristics
- Does not oxidize as readily as lead
- BiSn and BiSnAg are eutectic and near eutectic options

Low-Temperature Solder

Indalloy ®#	Liquidus (°C)	Solidus (°C)	Element 1	%	Element 2	%	Element 3	%	Element 4	%
1E	118	118	In	52.0	Sn	48.0				
1	125	118	In	50.0	Sn	50.0				
71	131	118	Sn	52.0	In	48.0				
281	138	138	Bi	58.0	Sn	42.0				
282	140	139	Bi	57.0	Sn	42.0	Ag	1.0		
290	143	143	In	97.0	Ag	3.0				
87	145	118	Sn	58.0	In	42.0				
203	150	125	In	95.0	Bi	5.0				
88	150	150	In	99.3	Ga	0.7				
225	151	143	In	90.0	Sn	10.0				
90	152	152	In	99.4	Ga	0.6				
91	153	153	In	99.6	Ga	0.4				
2	154	149	In	80.0	Pb	15.0	Ag	5.0		
92	154	154	In	99.5	Ga	0.5				
4	157	157	In	100.0						
204	175	165	In	70.0	Pb	30.0				
205	181	173	In	60.0	Pb	40.0				
231	186	174	Sn	86.5	Zn	5.5	In	4.5	Bi	3.5
227	187	175	Sn	77.2	In	20.0	Ag	2.8		
226	187	181	Sn	83.6	In	8.8	Zn	7.6		

Technical Support

Indium Corporation's internationally experienced engineers provide in-depth technical assistance to our customers. Thoroughly knowledgeable in all facets of Material Science as it applies to the electronics and semiconductor sectors, Technical Support Engineers provide expert advice in solder properties, alloy compatibility, and selection of solder preforms, wire, ribbon, and paste. Indium Corporation's Technical Support engineers provide rapid response to all technical inquiries.

Safety Data Sheets

The SDSs for these products can be found online at <http://www.indium.com/sds>

This product data sheet is provided for general information only. It is not intended, and shall not be construed, to warrant or guarantee the performance of the products described which are sold subject exclusively to written warranties and limitations thereon included in product packaging and invoices. All Indium Corporation's products and solutions are designed to be commercially available unless specifically stated otherwise.

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