SENJU LEAD FREE SOLDER

DAVUM TMC

EQUIPEMENTS POUR L'INDUSTRIE

ELECTRONIQUE

AERONAUTIQUE

AUTOSPORT

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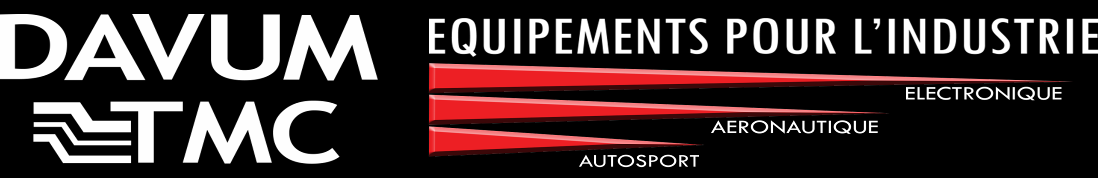


Lead-Free Solder

We offer various forms of solder material to provide the future of connection through total solutions.

Senju Metal Industry Co., Ltd. (SMIC) commercialized the standard lead-free solder material M705 in 2000, making a substantial contribution to eliminating lead from components and products. SMIC continues to develop and commercialize various forms of solder material using our solder alloy development capabilities, high-level metal processing technology, organic synthesis and viscoelasticity control technology, compounding technology, soldering technology, unique casting/forging technology, and granulation technology, with the aim of offering total solutions for soldering, including cost reduction, reliability enhancement, density enhancement, energy conservation and environmental sustainability enhancement.

ECO SOLDER CORED

Continue to take on new challenges and keep evolving

Flux Cored Solder ··· P3

ECO SOLDER PASTE

Realizes next-generation mounting

Solder Paste ··· P5

ECO SOLDER POWDER

Created using our unique ultra-microfabrication technology

Transfer Solder Sheet ··· P8

ECO SOLDER BAR & WIRE

Environmentally sustainable, using alloy composed of plentiful metals

Bar & Wire ··· P9

ECO SOLDER PREFORM

Changes the future of mounting

Solder Preform ··· P11

ECO SOLDER BALL

Realizes semiconductor mounting that is a step ahead

Solder Ball ··· P13

LIQUID FLUX

Promises effective solder wettability

Liquid Flux ··· P15

FLUX for SEMI-CONDUCTORS

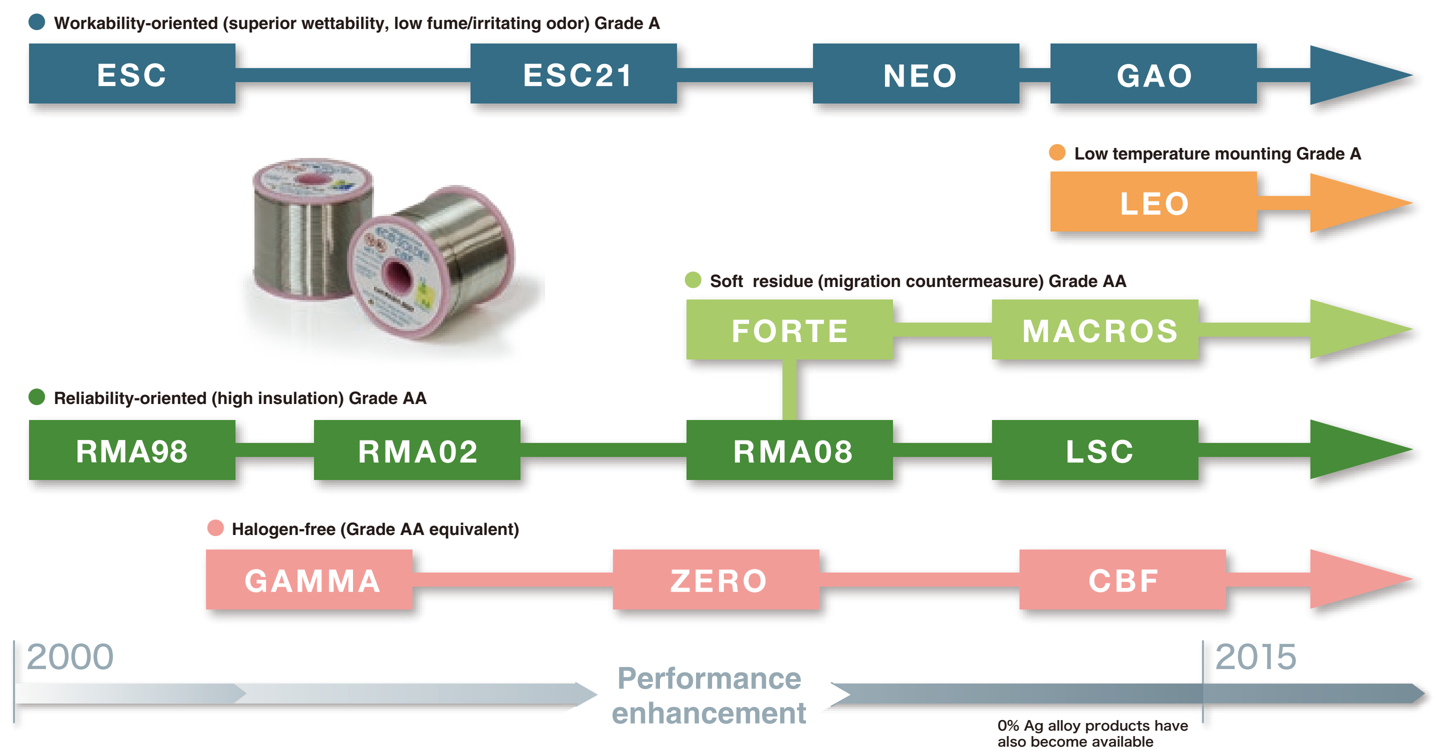
Takes advantage of organic synthesis technologies

Flux for Semi-Conductors ··· P17

ECO SOLDER CORED

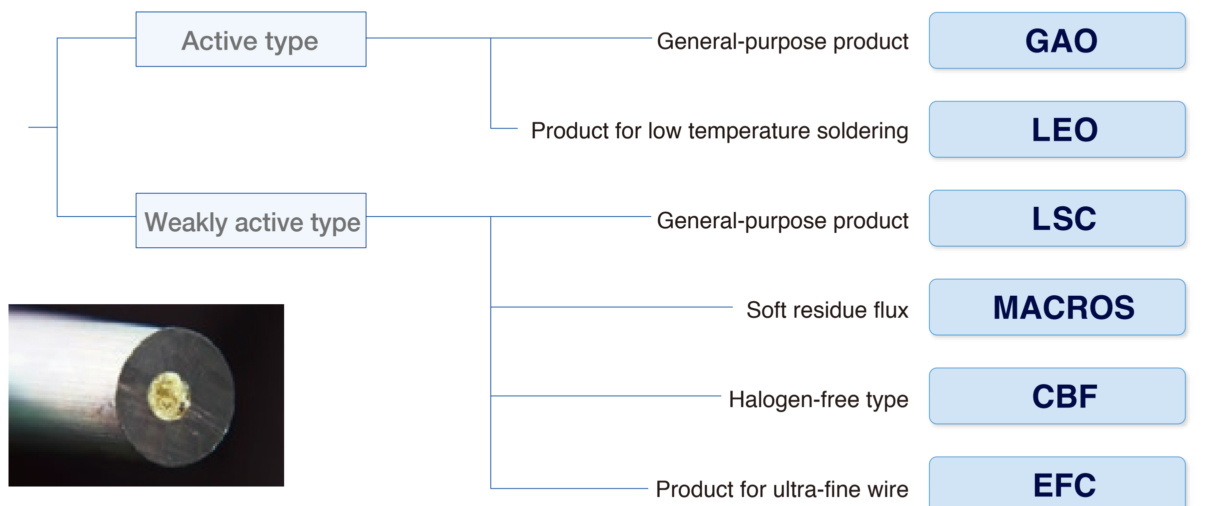
Flux cored solder is a product in which flux is incorporated into the center part of wire solder alloy

Lead-free flux cored solder that continues to take on new challenges and keeps evolving



Select products according to your purpose or application

- **GAO series** Guarantees good wettability and work environment
- **LEO** Sn-Bi solder with a low melting point that realizes low temperature mounting
- **LSC** Guarantees high insulation reliability with accumulated experience and results
- **MACROS** Optimal for severe environments including automotive applications
- **CBF** Ensures good wettability despite being halogen-free
- **EFC** Realizes narrow pitch soldering with ultra-fine wire



GAO Delivers a good work environment and a beautiful appearance after soldering

Products are available in two types: GAO-ST that thoroughly supress burning and air bubbles and GAO-LF with an enhanced ability to suppress fumes and irritating odors.

Recommended alloys ; M24MT/M24AP

Evaluation of residual air bubbles

Air bubbles

Conventional product | GAO-ST

Evaluation of fuming after 3 seconds of soldering at 450°C

Conventional product | GAO-ST | GAO-LF

Evaluation of burning after 8 seconds of soldering at 380°C

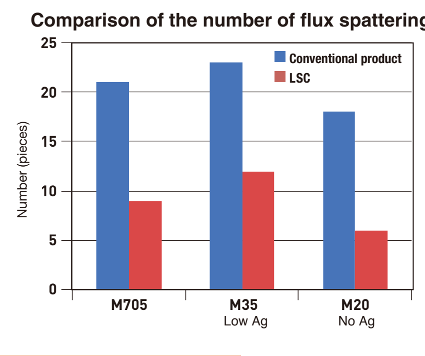
Conventional product | GAO-ST | GAO-LF

LSC Realizes low spattering with low or no Ag content

LSC is a weakly active type general-purpose product with high insulation characteristics.

It is a low spatter type product realized through accumulated technologies featuring high reliability, which is also suitable for soldering using robots.

Comparison of the number of flux spattering



Recommended alloys ; M20/M35

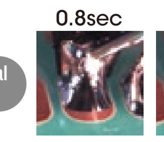
CBF Ensures good wettability while containing no halogen

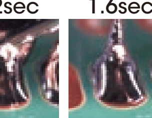
We have two halogen-free products: CBF that satisfies the industry standard and ZERO that contains absolutely no halides.

Our halogen-free products are marked by pink spools.

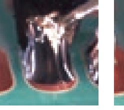
0.8sec | 1.2sec | 1.6sec

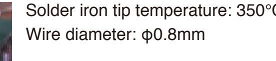
Conventional product





ZERO





Solder iron tip temperature: 350°C
Wire diameter: φ0.8mm

CBF

CBF: Chlorine and bromine contents are no more than 900 ppm respectively.
ZERO: Contains absolutely no halides.

Recommended alloys ; M705

MACROS Soft residue flux is optimal for automotive applications with condensation risk

MACROS features flux residue that does not crack even under mechanical bending or thermal stress, and prevents electro-ionic migration caused by condensation.

In addition, water repellency and excellent adhesion to substrates help to prevent migration or corrosion under high temperature/high humidity load tests.

Target alloys ; M705

Bending test

Thermal stress test

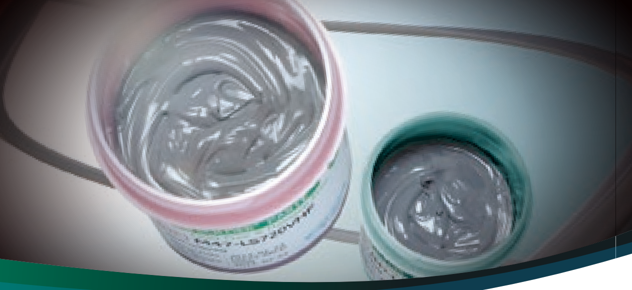
LEO The first product in the industry capable of soldering at 200°C

LEO is capable of soldering at 200°C, realizing cost reduction through the adoption of low heat-resistant substrates or components.

SMIC has succeeded in commercializing flux cored solder using rigid and fragile Sn-Bi alloy having poor malleability by taking full advantage of its unique processing and wire drawing technologies.

Successfully-processed LEO

Target alloys ; L20/L27

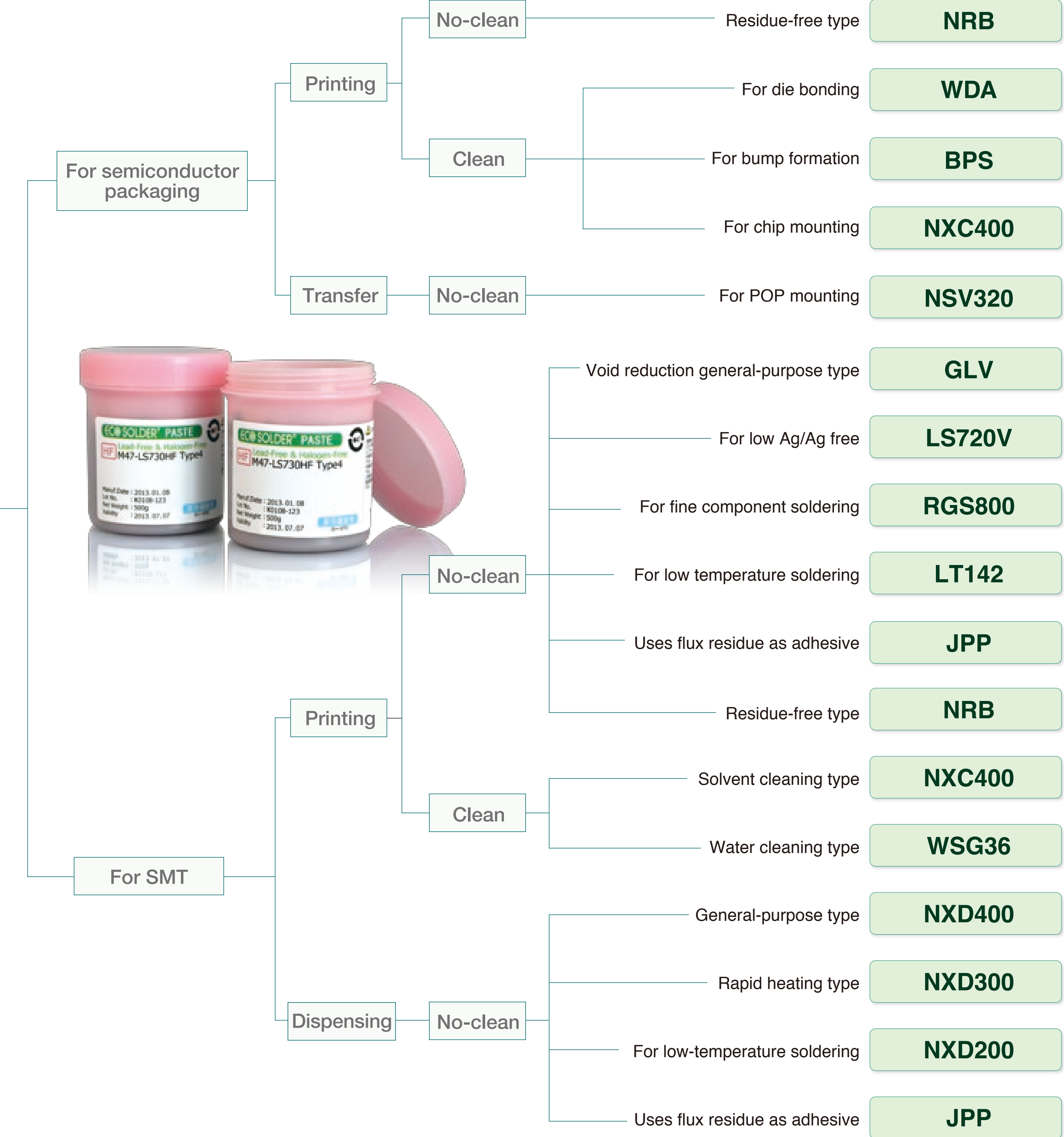


ECO SOLDER PASTE

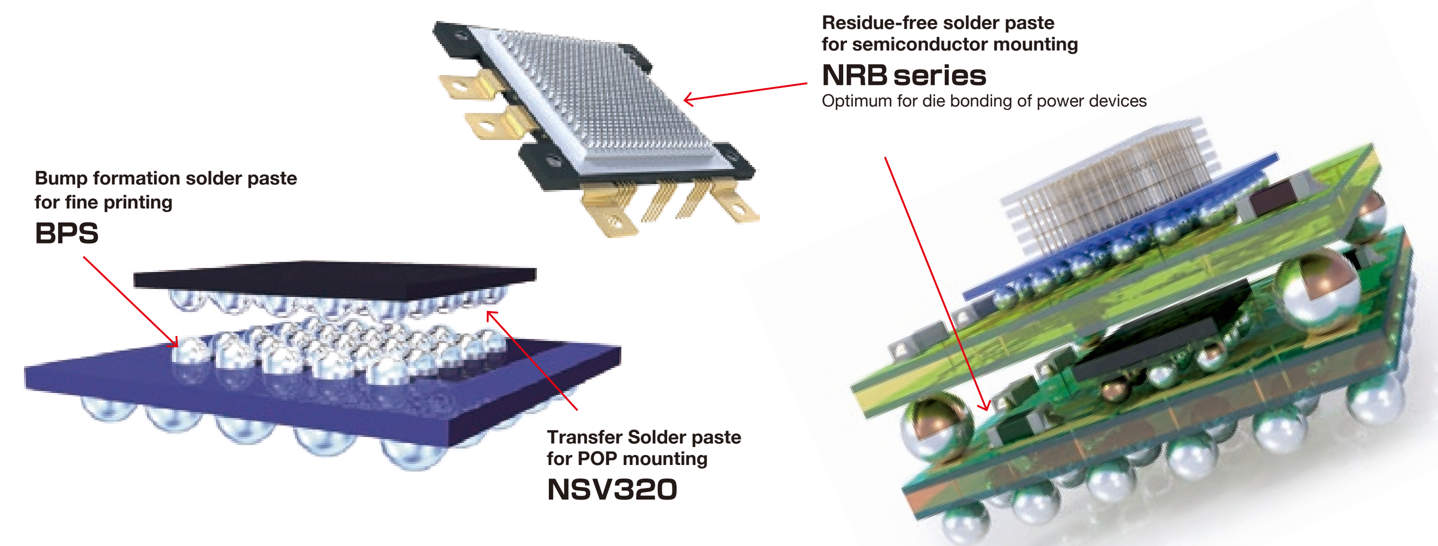
Solder paste is a product in which fine powder solder alloy and flux component are mixed

Choose optimal solder pastes according to your purpose or application for the development of next-generation products

A halogen-free type is available for each product.



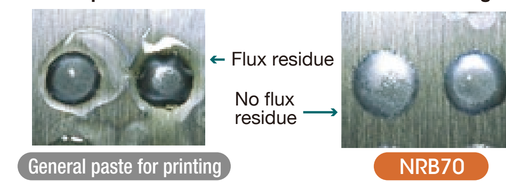
Solder paste for semiconductor packaging

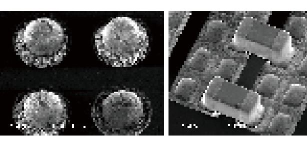


NRB Realizes residue & cleaning free mounting with a non-rosin-type flux

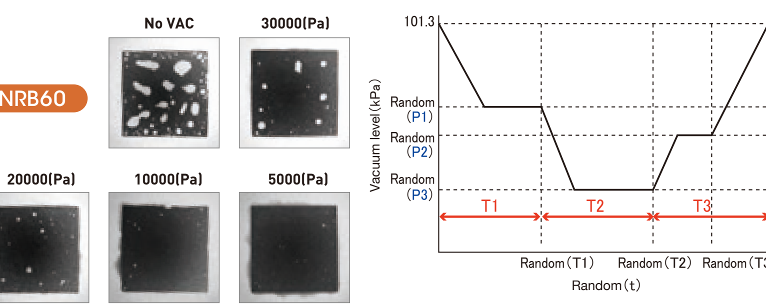
Recommended alloy ; M705

Comparison of flux residue after reflow soldering





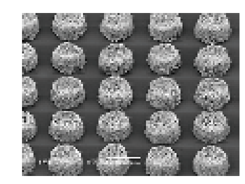
NRB70 produces no flux residue even during N² reflow soldering.

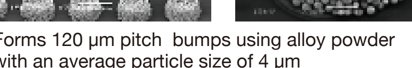


Realizes low spattering residue & void-free soldering with the vacuum reflow oven SVR-625GT capable of controlling the vacuum degree

BPS Features good printability and forms even bumps with a small amount of voids

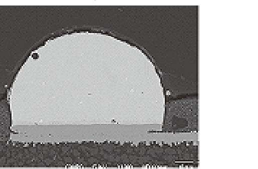
Recommended alloys ; M705/M200



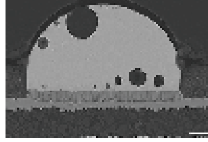


Forms 120 µm pitch bumps using alloy powder with an average particle size of 4 µm

Exhibits good wettability despite using fine powder, forming bumps with a small amount of voids



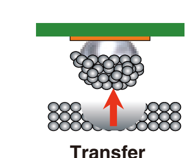
Forms bumps with a small amount of voids



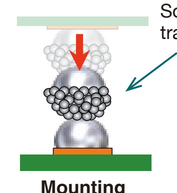
Conventional product

NSV320 Capable of transferring a sufficient amount of solder, realizes POP mounting with high joint reliability

Recommended alloy ; M705

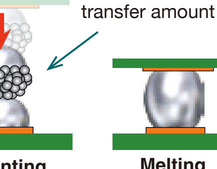


Transfer

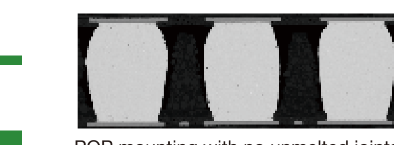


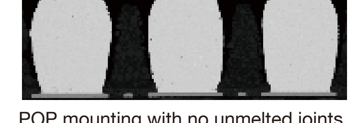
Mounting

Soldered with a sufficient transfer amount

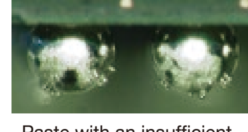


Melting

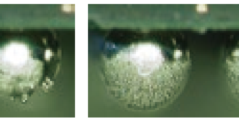




POP mounting with no unmelted joints



Paste with an insufficient transfer amount



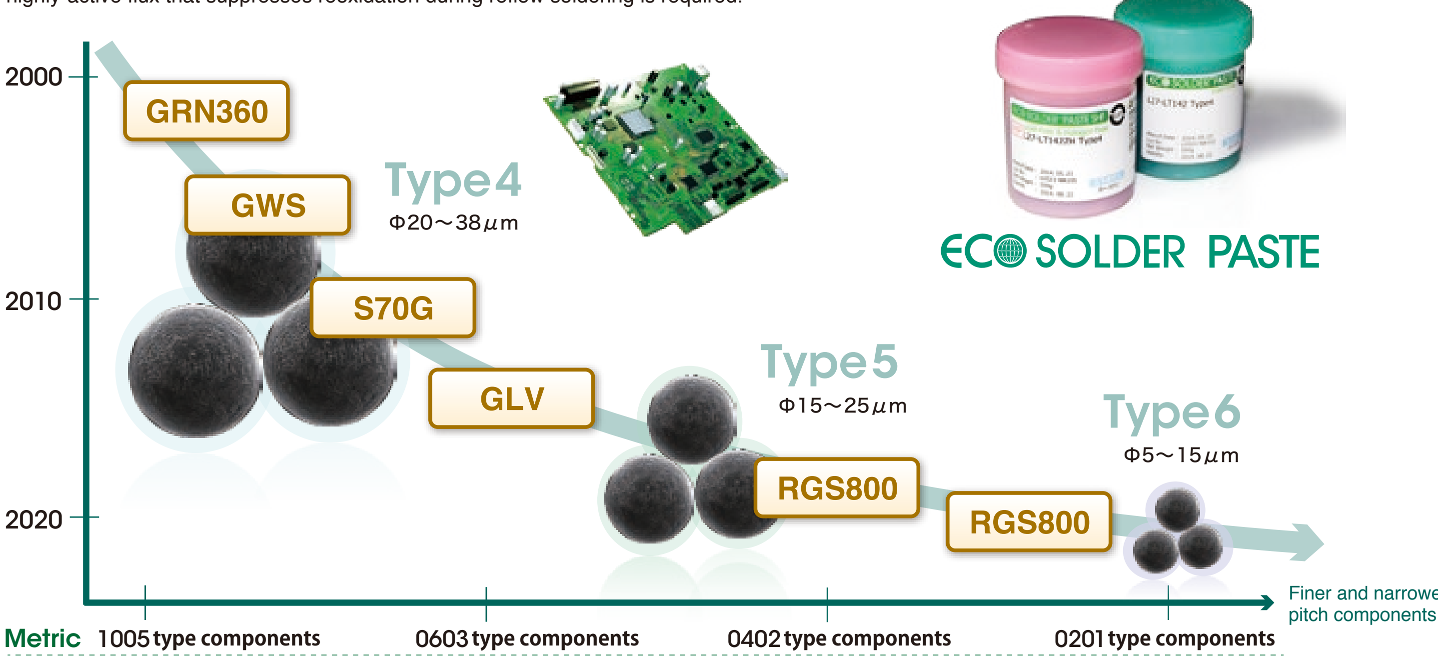
NSV320 with a sufficient transfer amount

NOTE: About recommended alloys, please refer to the main alloys table on page 25.

Solder paste for SMT

Flux developed along with the micronizing of powder grains

As powder grain becomes finer, the surface area and amount of oxidation increase. Therefore, highly-active flux that suppresses reoxidation during reflow soldering is required.



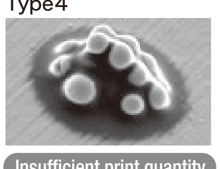
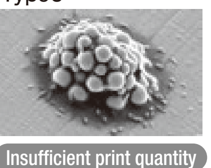
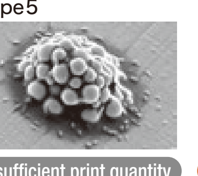
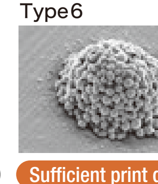
RGS800

Exhibits good wettability even with fine powder, enabling mounting of 0201 components

M705-RGS800 Type6

Enabling jointing of 0201 components.

Ensures a sufficient amount of solder even for micro patterns by adopting RGS800 and Type 6 micro powder.

Type4	Type5	Type6
	 	
Insufficient print quantity	Insufficient print quantity	Sufficient print quantity

Recommended alloy ; M705

GLV

Significantly-reduced void generation realized through the improvement of flux

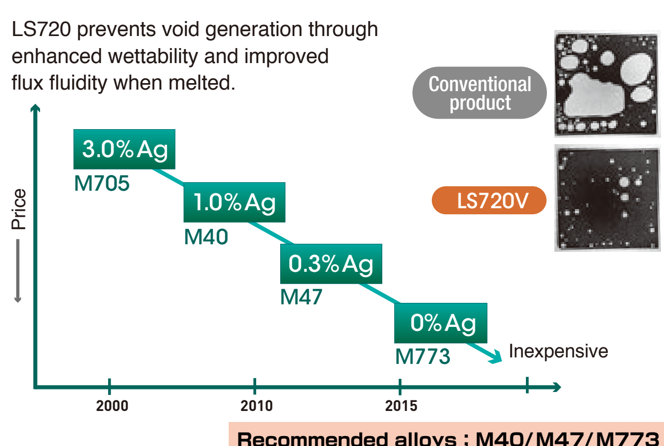
GLV prevents void generation on large bottom termination components, in which the temperature does not rise easily, and significantly reduces unmelted solder balls in BGA soldering.

Target alloys ; M705/M794/M758

LS720V

Prevents void generation by Low-Ag/Ag-free flux

LS720 prevents void generation through enhanced wettability and improved flux fluidity when melted.

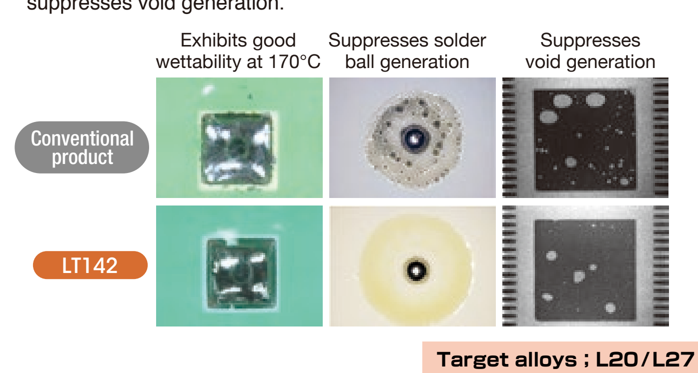


Recommended alloys ; M40/M47/M773

LT142

Realizes cost reduction through energy conservation by flux for alloys with low melting points.

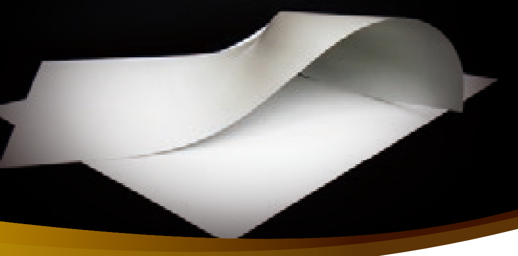
LT142 features flux with an improved active component which enhances the reflow properties of the Bi alloy that becomes very easily oxidized and suppresses void generation.



Target alloys ; L20/L27

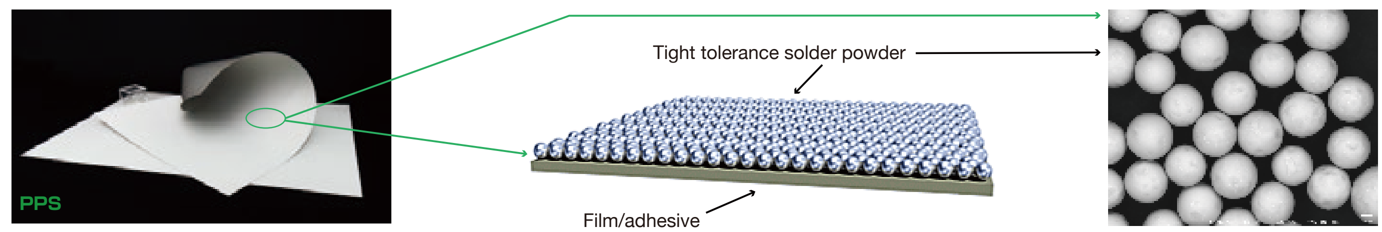
ECO SOLDER POWDER

PPS is a transfer solder material in which fine solder powder is adhered to a film sheet

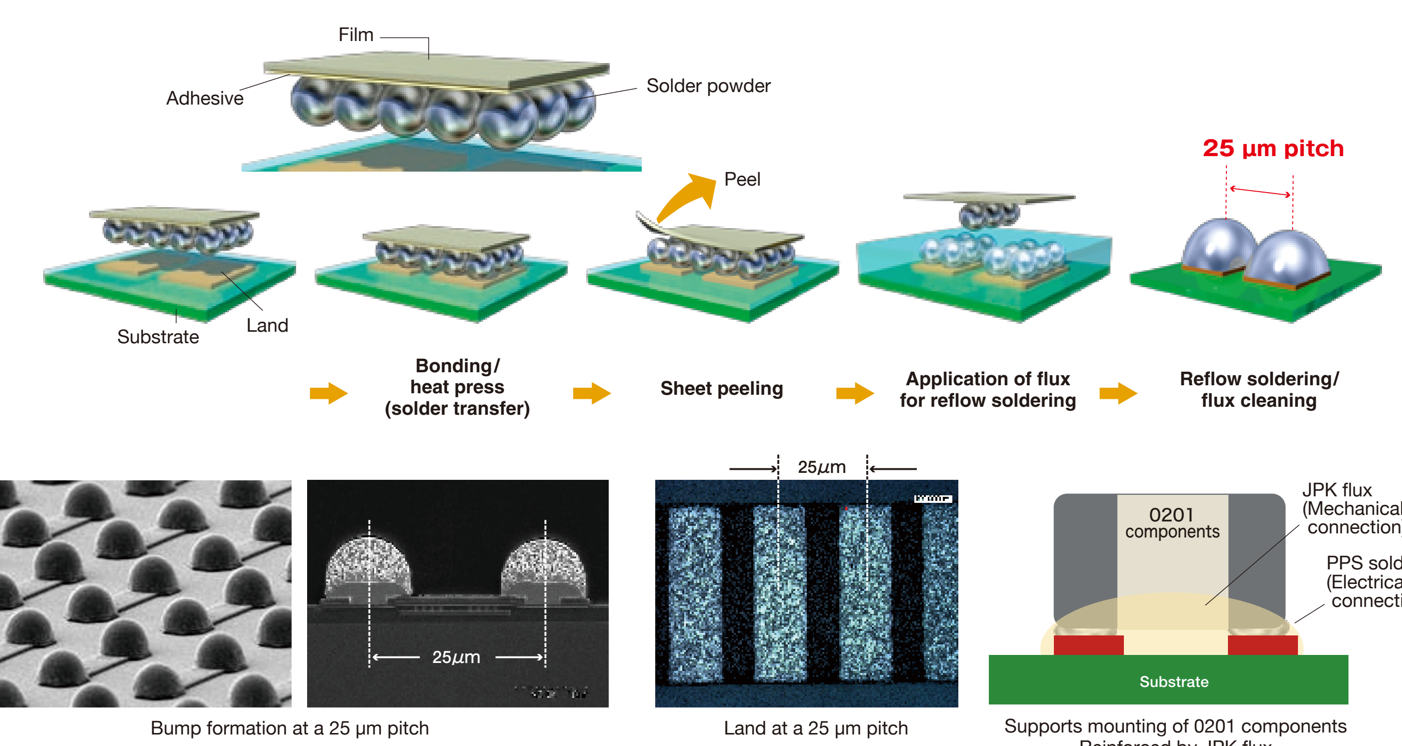


Transfer solder sheet PPS (Pre Coated Powder Sheet)

PPS is created through the development of a unique granulation method that enables the production of micro-fine spherical powder.



Enables narrow pitch bump formation or jointing of narrow pitch patterns

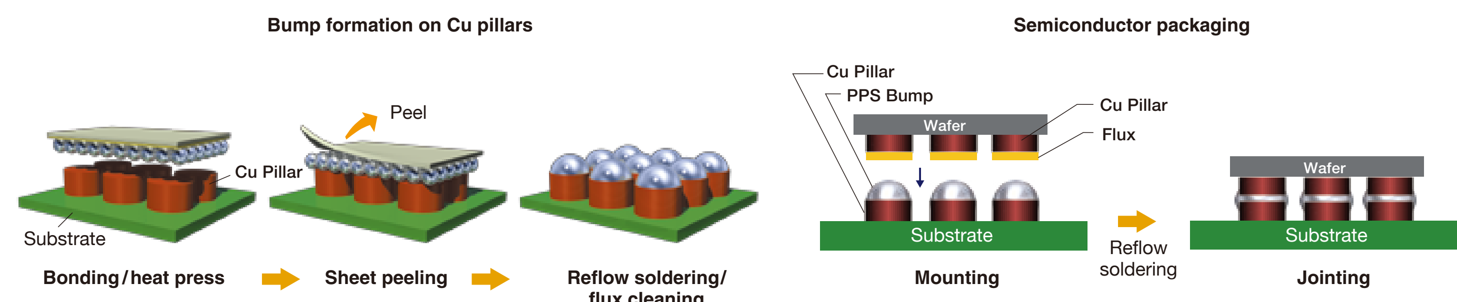


Bump formation at a 25 μm pitch

Land at a 25 μm pitch

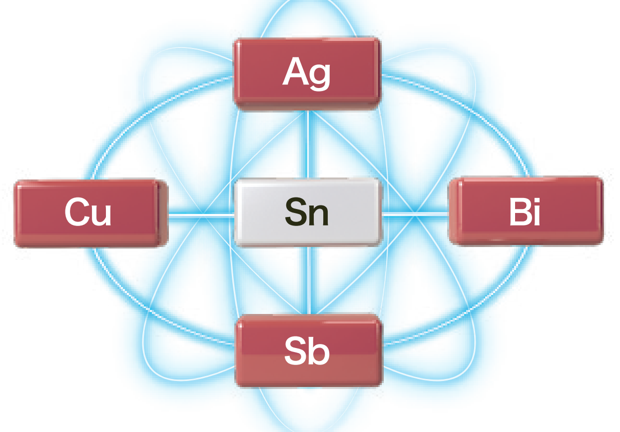
Supports mounting of 0201 components Reinforced by JPK flux

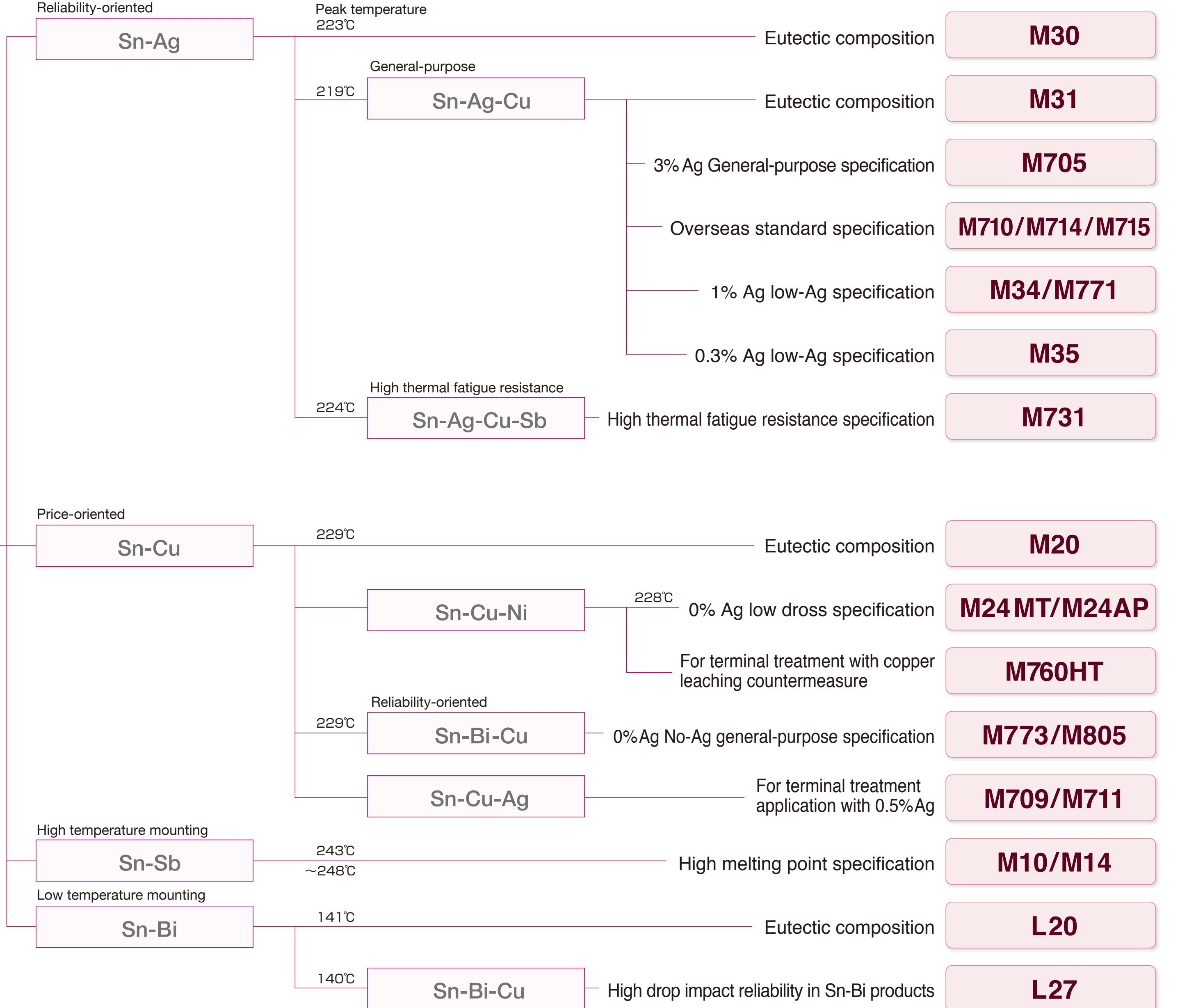
Supports next-generation semiconductor packaging by eliminating plating processes with bump formation on Cu pillars



ECO SOLDER BAR & WIRE

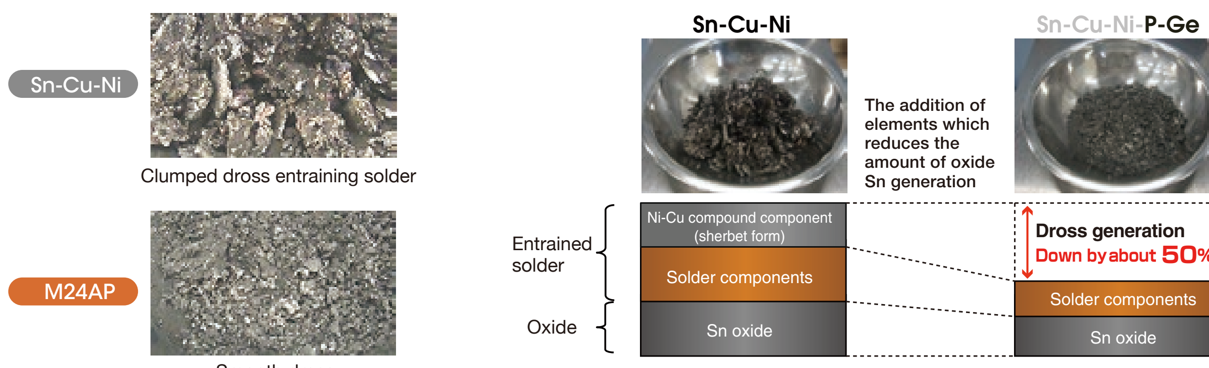
Solder bars are melted in a solder bath and used for packaging of insertion components or terminal treatment of components



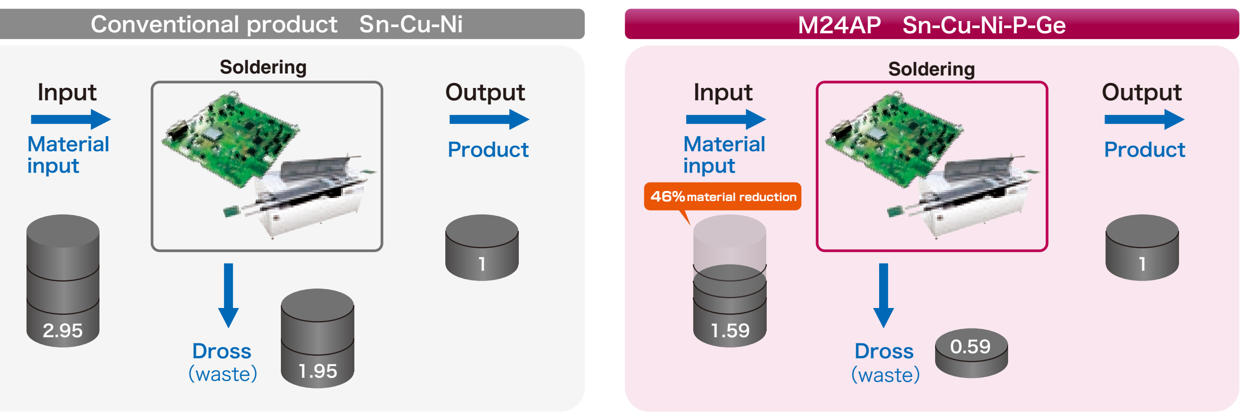


Material that generates little amount of dross

■ The MT series and AP series containing phosphorus and germanium thoroughly suppresses dross generation.



To produce "1" product, the required amount of the conventional material is "2.95," whereas only "1.59" is required when using the MT/AP series.



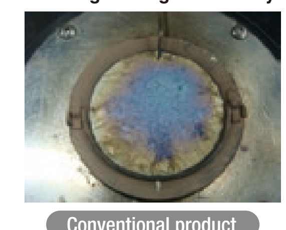
By suppressing dross, 46% of the usage amount is reduced and cost reduction is promoted.

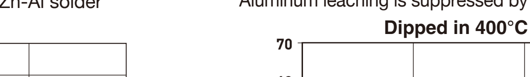
Sn-Zn-Al solder materials for aluminum jointing

■ ALS A151 and A091 are solder materials for aluminum jointing that suppress galvanic corrosion.

On light-weight and inexpensive aluminum, galvanic corrosion easily occurs due to the large potential difference from tin, causing jointing defects. In ALS A151 and A091, galvanic corrosion is suppressed by the use of zinc, which has a small potential difference from tin.

When using Sn-Ag solder, corrosion and peeling occurs after 25 hours



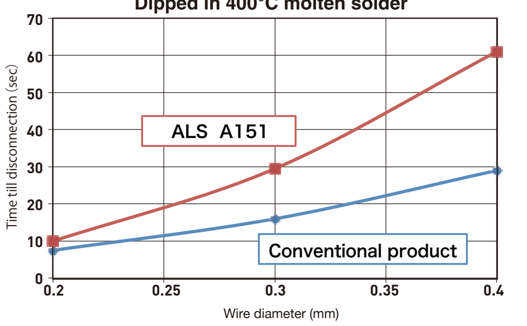


Corrosion test

Joint strength (N): 0, 50, 100, 150, 200, 250, 300, 350, 400

ALS A091 / ALS A151 / Sn-Ag solder

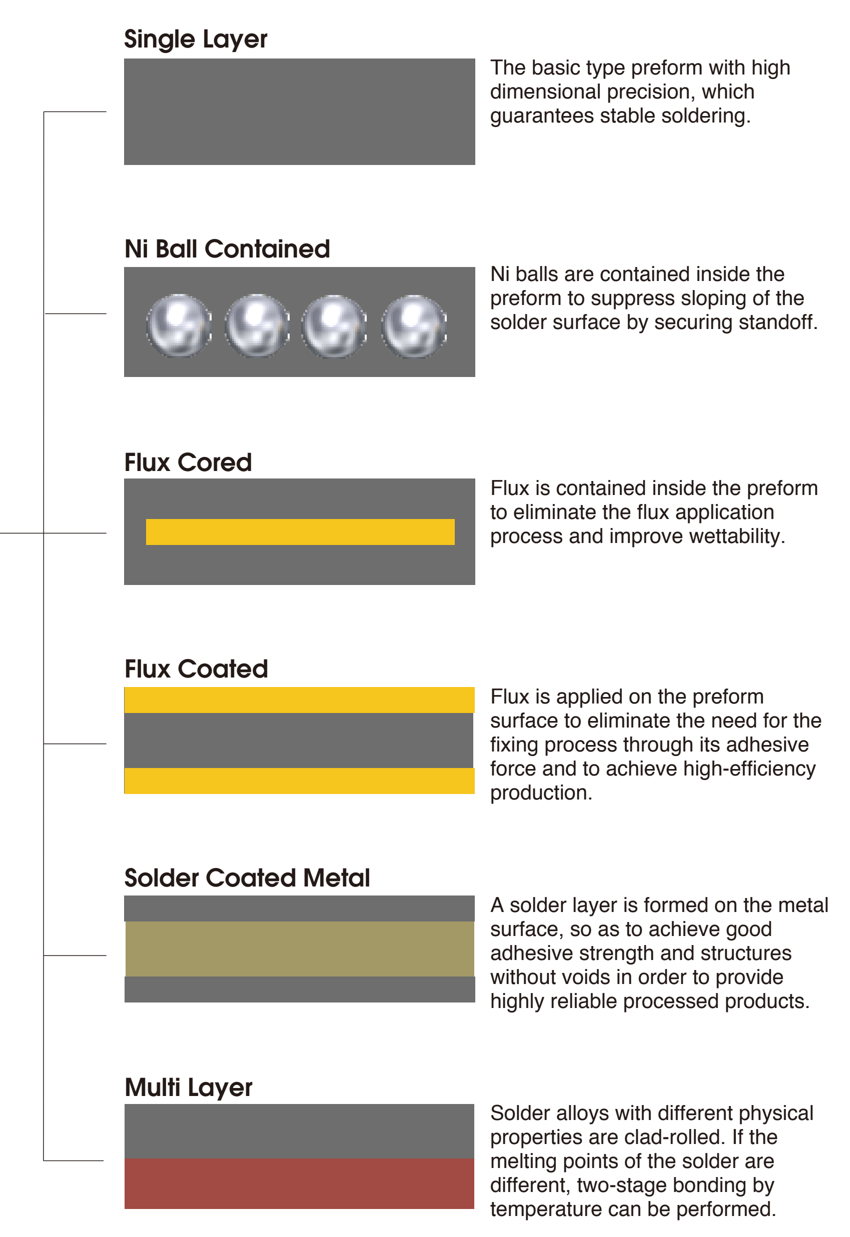
3% salt solution immersion time (hr): 0, 5, 10, 15, 20, 25



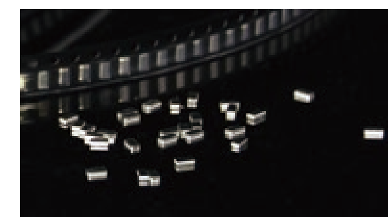
ECO SOLDER PREFORM

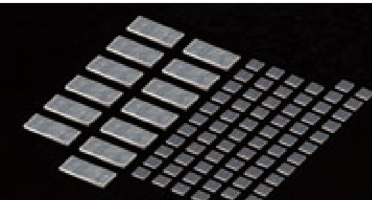
Preform realizes effective soldering by forming solder alloys into various shapes

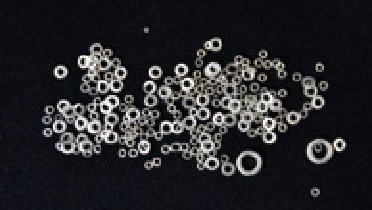
Forms various alloys or structural materials into various shapes so that soldering can be performed in desired forms



Major forms







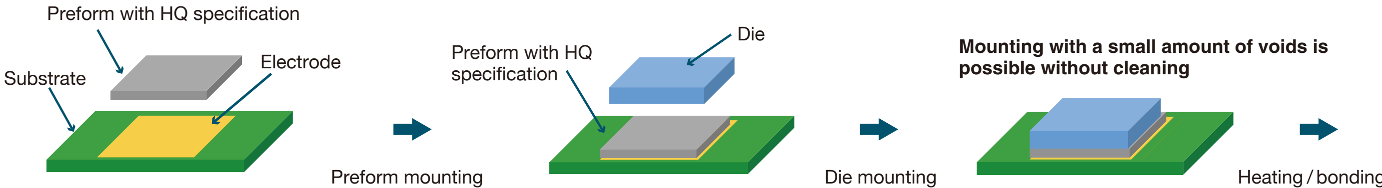
Surface treatment specification

General-purpose product	S	Standard Surface Condition	Suitable for flux application or mounting in a reducing atmosphere. Available in each product structure type.
Flux-free	HQ	High-Quality Surface Condition	Oxide film on the surface is reduced by special processing to enable flux-free mounting or mounting in a reducing or inert atmosphere.

Application Examples

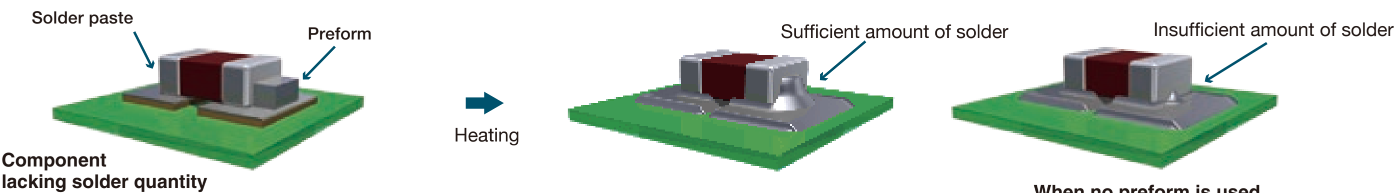
Application1

Die bonding using a single layer or Ni ball contained preform suppresses void generation and realizes mounting with high heat radiating effect. The need for flux is eliminated by using a product with an HQ specification, enabling clean mounting even without cleaning.



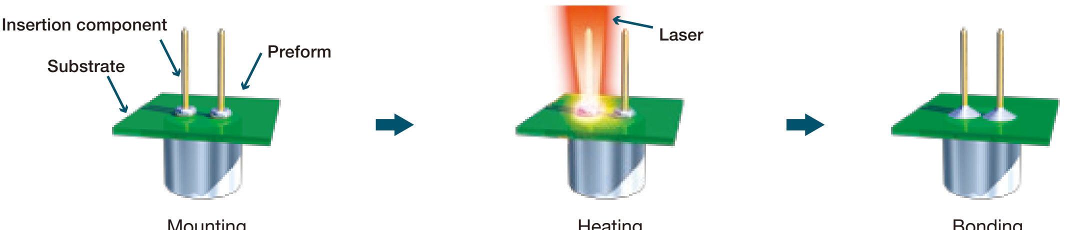
Application2

The single layer or flux coated material is processed into a chip form and automatically mounted on a pad lacking solder quantity through tape packaging, in order to supply solder and enhance strength. SMIC's unique chip surface processing technology increases the mounting precision.



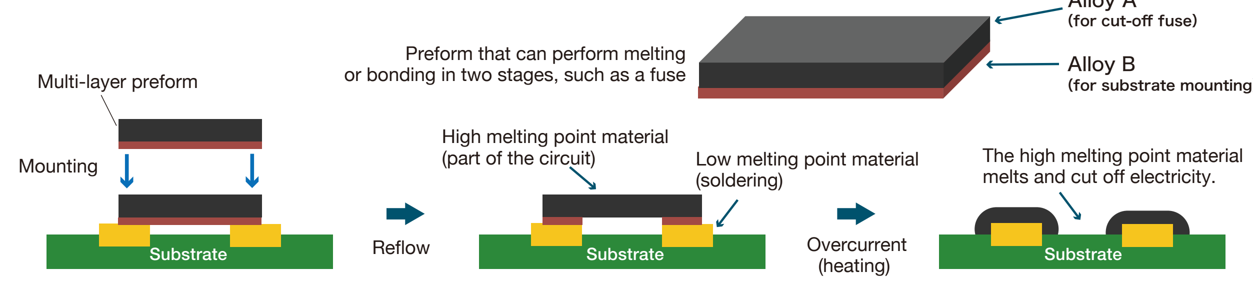
Application3

A ring shape preform is inserted into the terminals of the insertion component passing through the through-holes of the substrate and locally heated by a laser or other methods to perform soldering without causing thermal damage to the substrate or component.



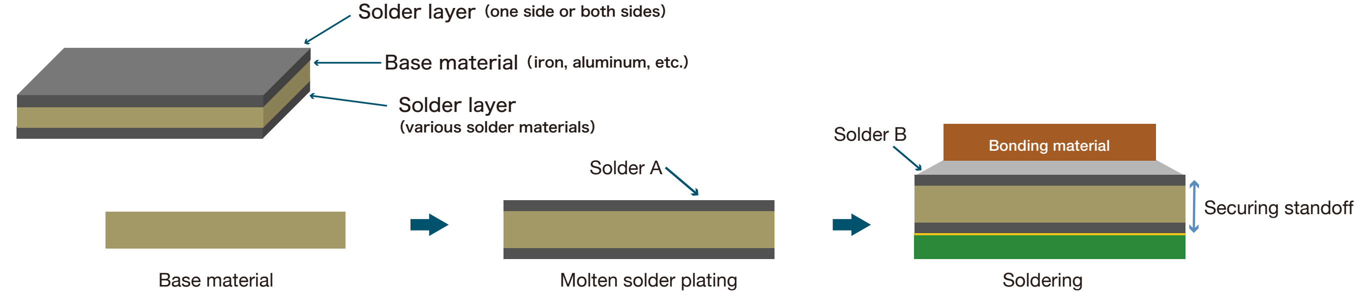
Application4

Alloys with different melting temperatures are laminated in a bimetal structure and bonded to a substrate with solder with a low melting point. By making solder that does not melt at the mounting temperature a part of the overcurrent detection circuit, the solder will melt and cut off the circuit when an abnormality occurs.



Application5

The solder coated material is a product in which the surface of the base material that cannot easily be soldered or does not melt at the soldering temperature is coated with molten solder. It is optimal for bonding to aluminum, applications requiring standoff, or for airtight sealing cases.

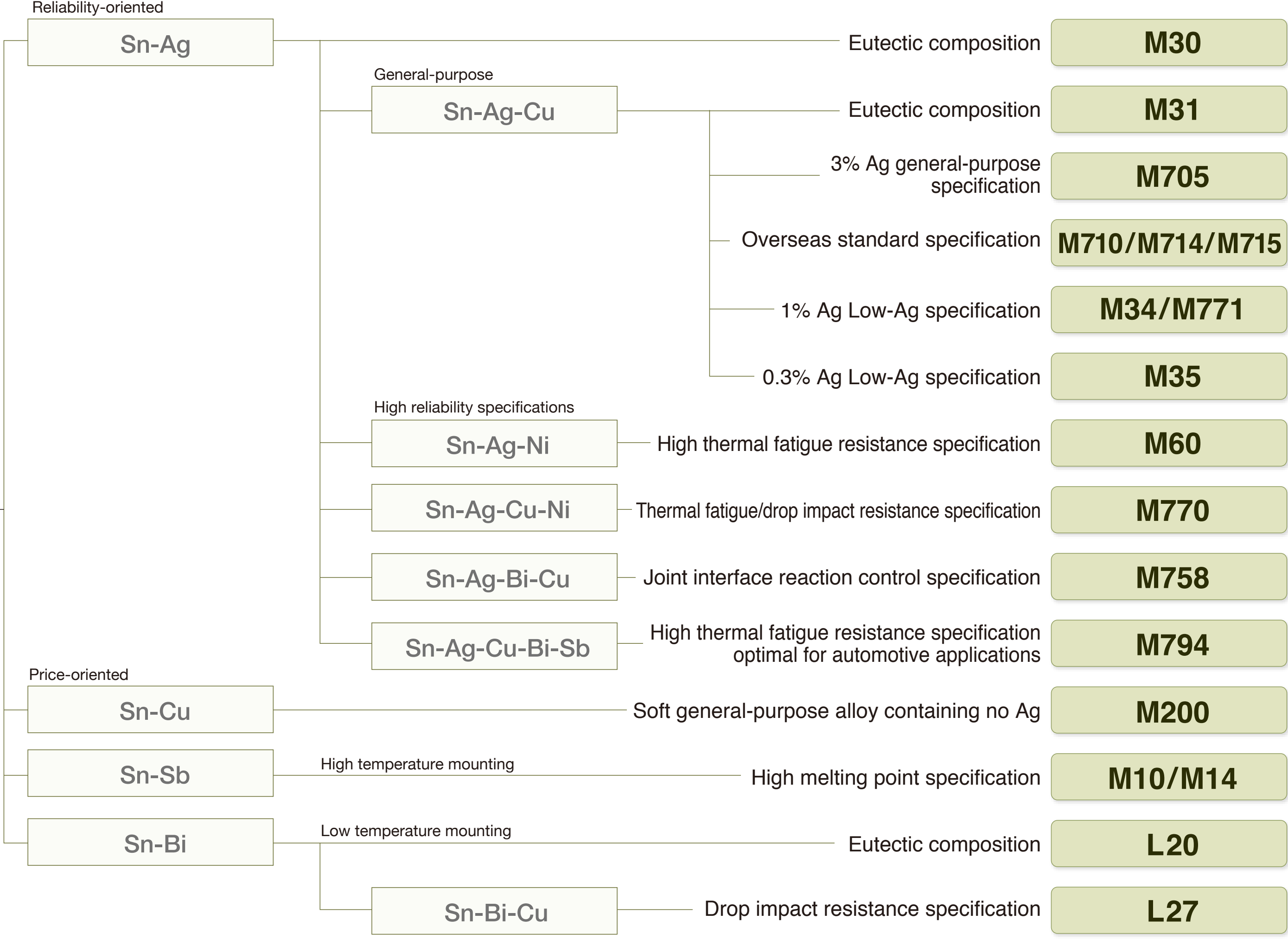


ECO SOLDER BALL

Solder ball features high sphericity, as well as guaranteed dimensions or tolerances

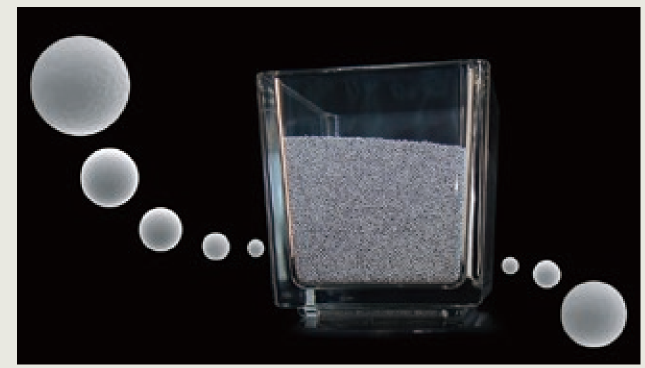
Products with various ball diameters and compositions are available to support cutting-edge semiconductor mounting

Tight tolerance solder ball with diameters ranging from 760 to 20 μm are available.



LAS solder ball protects products from "soft errors"

Slight amounts of alpha rays or cosmic rays discharged from solder materials or semiconductor materials can rewrite memory data, which is called a "soft error." In particular, flip chip packages are highly sensitive to soft errors, and the reduction of alpha rays is therefore required for solder materials or other electronic mounting materials. An LAS solder ball is a material that meets such a requirement.



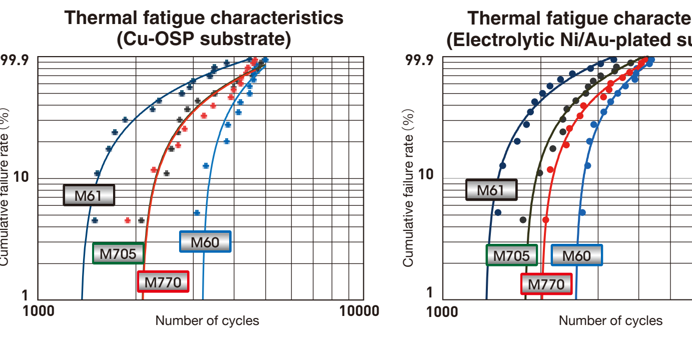
■ **Standard specification product**
Diameter and tolerance ; 50～100μm±3μm
Alpha count ; Less than 0.002 cph/cm2
Composition ; M705 M200

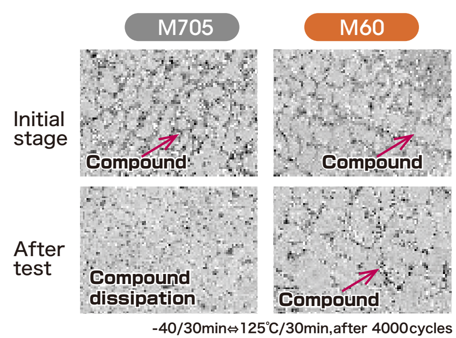
■ **Special specification product**
Various specifications are available upon request.
Please contact us for details.

M60 Using a softer material to buffer stress on solder bulk, M60 is optimal for applications requiring high thermal fatigue resistance

Sn-2.3Ag-Ni-x

In M60, the solder bulk is softer than typical SAC alloy with reducing Ag content to provide buffer against external stress, and Ni and x are added to improve the fracture mode by reforming the joint interface without losing the intermetallic compound network that maintains the bulk strength after receiving a thermal stress load. As a result, a product that exhibits good thermal fatigue resistance for the various surface finish.



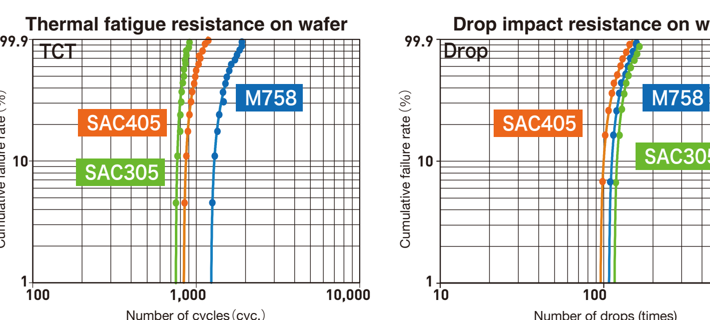


Owing to the addition of a slight amount of Ni and x, the compound network is maintained after receiving a thermal stress load, securing the bulk strength.

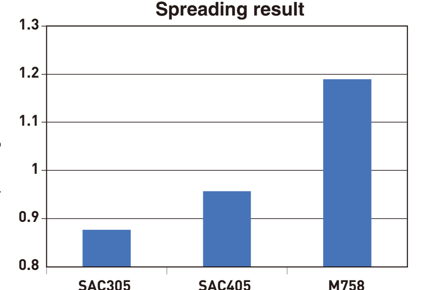
M758 With an improved joint interface, M758 is optimal for bump formation on wafers

Sn-3Ag-3Bi-0.8Cu-Ni

In M758, Bi is added to achieve solid solution strengthening and enhance bulk strength in addition to precipitation strengthening in the Sn-Ag-Cu alloy, while reaction at the joint interface is controlled by the addition of a slight amount of Ni to achieve robust joint strength, which makes the product optimal for bump formation on wafers where stress caused by differences in the thermal expansion coefficients is large. In addition, M758 exhibits good wettability on packages with Cu plating.



M758 exhibits superior thermal fatigue resistance compared to conventional products such as SAC305 or SAC405, due to solid solution strengthening by the addition of Bi. It exhibits equivalent or greater results in the drop impact resistance test.

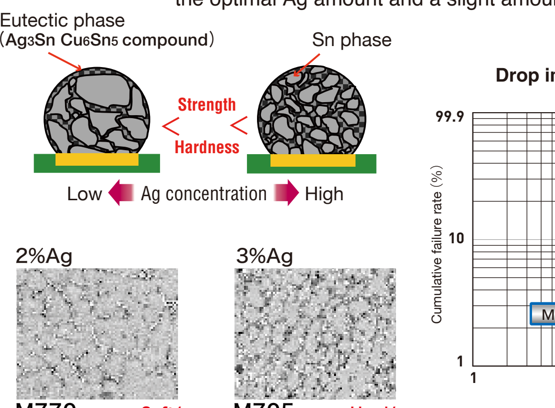


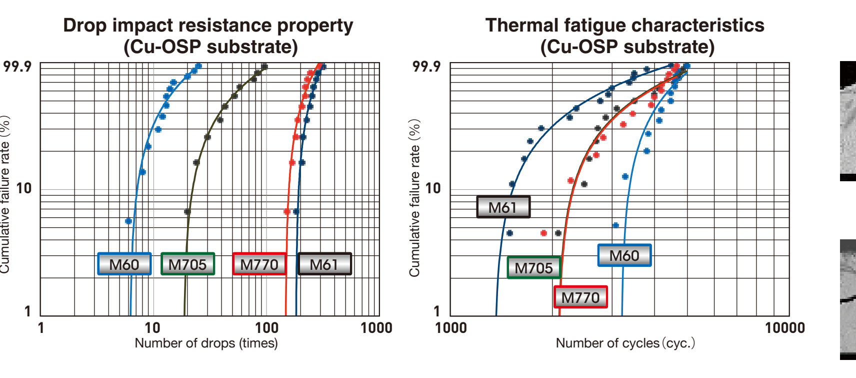
M758 exhibits good wettability on packages with Cu plating.

M770 Achieving both thermal fatigue resistance and drop impact resistance simultaneously, M770 is optimal for bump formation on substrate

Sn-2Ag-Cu-Ni

When Ag content is increased, the precipitation amount of compound (Ag_3Sn) in solder increases, making the solder harder and giving it greater mechanical strength. The opposite occurs when the Ag content is reduced. Utilizing this property, SMIC has developed M770, which achieves both thermal fatigue resistance and drop impact resistance simultaneously, by studying the optimal Ag amount and a slight amount of additive.



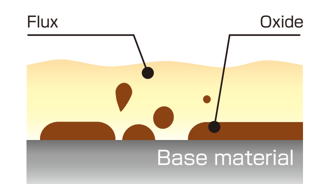


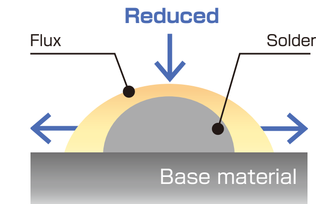
LIQUID FLUX

Liquid flux is a liquid flux consisting of resins such as rosin, and activators or solvents

Choose products that are effective for soldering according to your purpose or application

Roles of flux

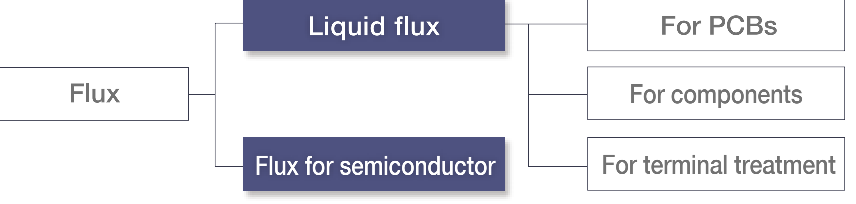




① Surface cleaning action
Isolates oxides on the metal surface.

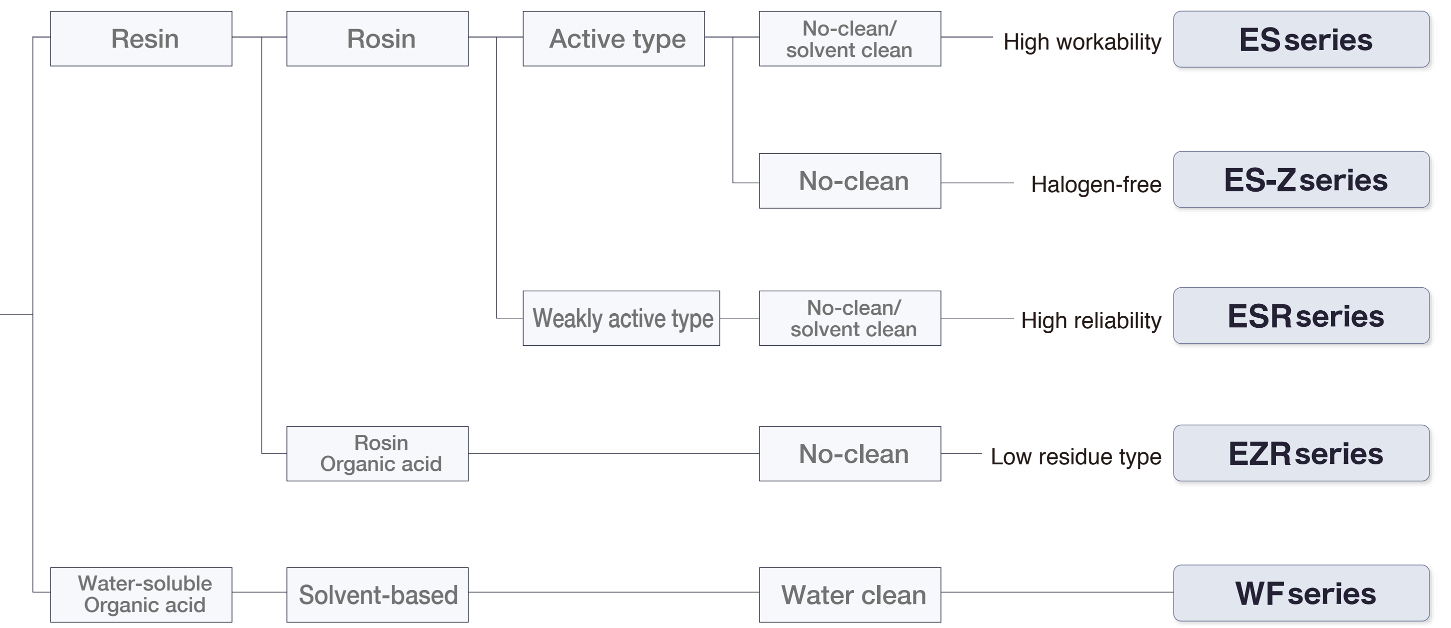
② Prevention of reoxidation
Creates a thin film between air and the solder to protect the solder and base material surface.

③ Promotion of wettability
Reduces the surface tension and promotes spreading through a capillary action.

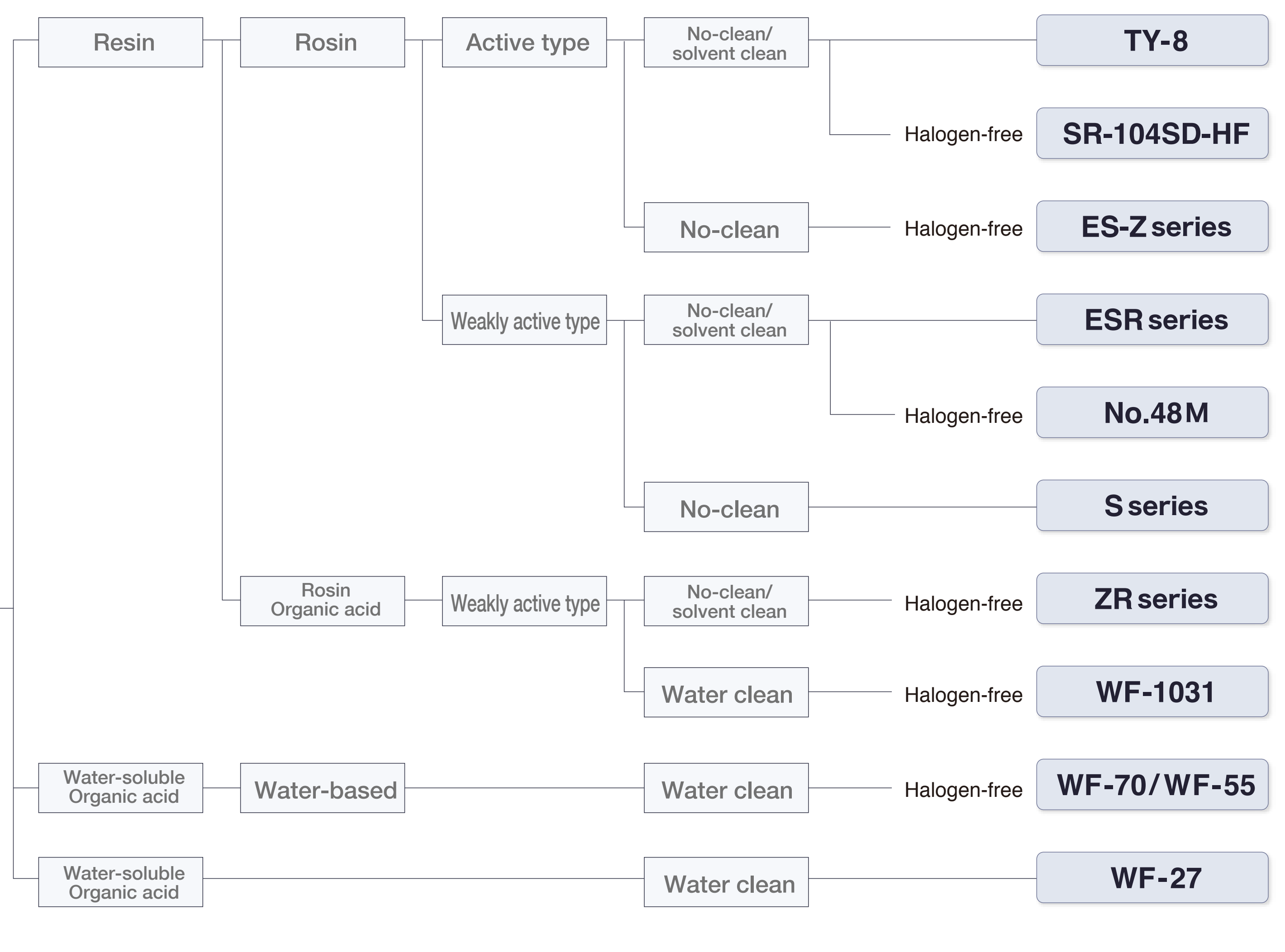


Flux for PCBs

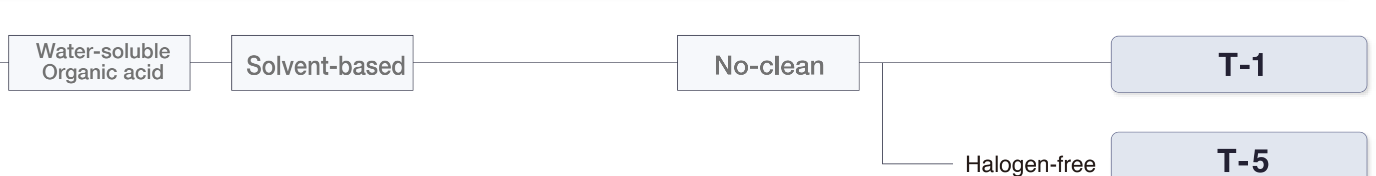
- **ES series** Promises high workability, including excellent wettability
- **PO-Z series** Promises excellent workability despite containing no halogen
- **ES-Z series** Realizes halogen-free and no-clean soldering
- **ESR series** High reliability flux with high insulation property
- **EZR series** Low residue flux that achieves a beautiful finish on the substrate surface
- **WF series** Eco-friendly flux that can be cleaned with water



Flux for components

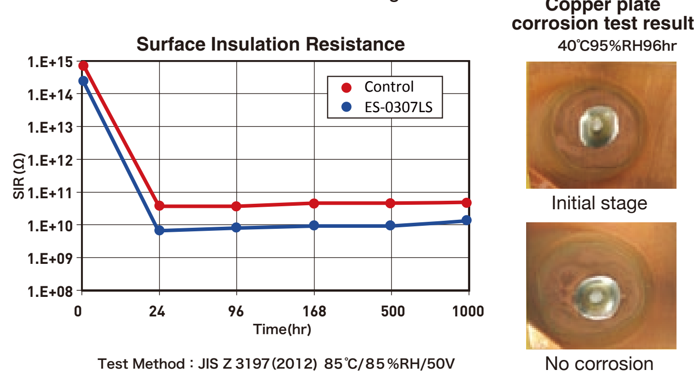


Flux for terminal treatment



ES series

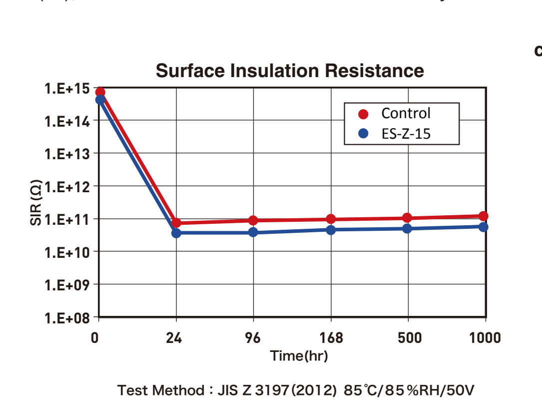
The ES series are suitable for low Ag solders. Its good solder wettability prevents bridging.
The series also achieves good lusterless finishes on Sn-Cu solders, which enables easy and accurate appearance checks. Its flux residue is highly reliable and suitable for no-clean soldering.



Test Method : JIS Z 3197(2012) 85℃/85%RH/50V

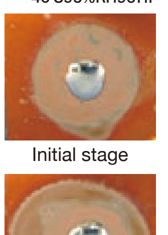
ES-Z series

The ES-Z series are halogen-free rosin fluxes. Its residue after soldering exhibits high reliability, making the series suitable for no-clean soldering.
The series contains only 900 ppm or less of chlorine (Cl) and bromine (Br), as no chlorine or bromine is intentionally added.



Test Method : JIS Z 3197(2012) 85℃/85%RH/50V

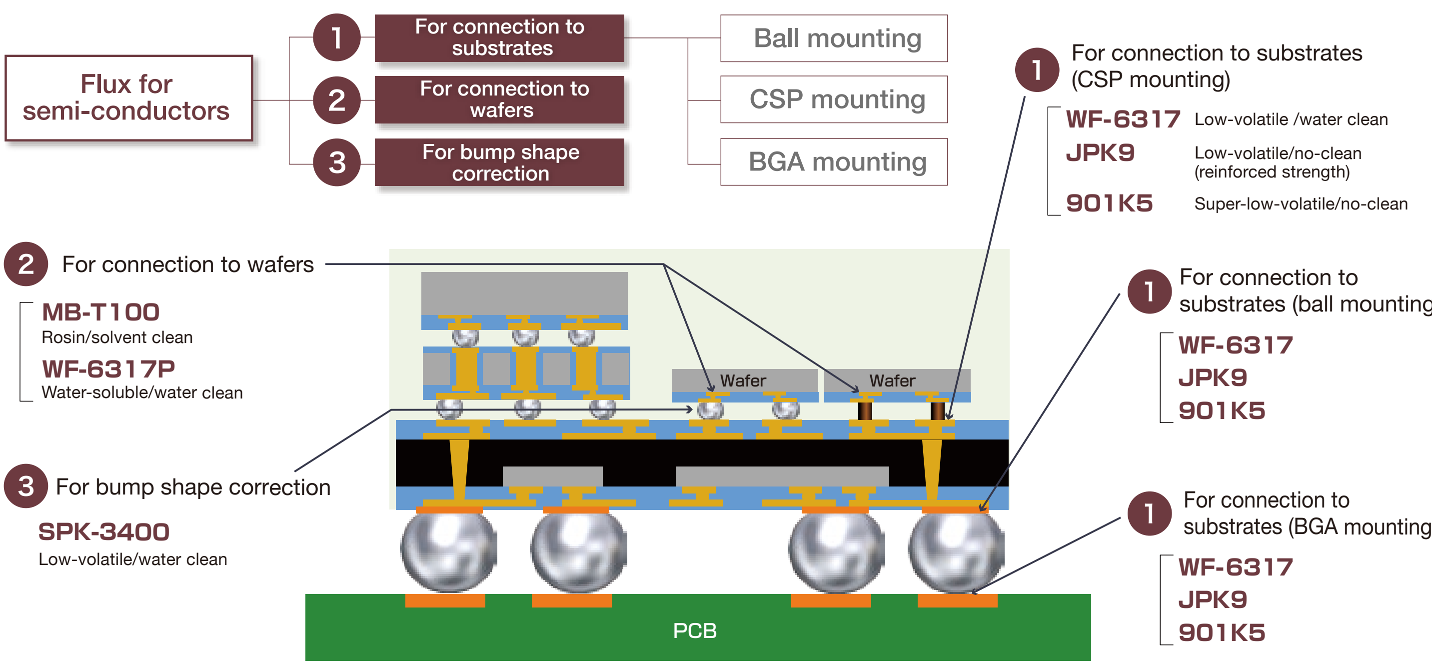
Copper plate corrosion test result
40℃95%RH96hr



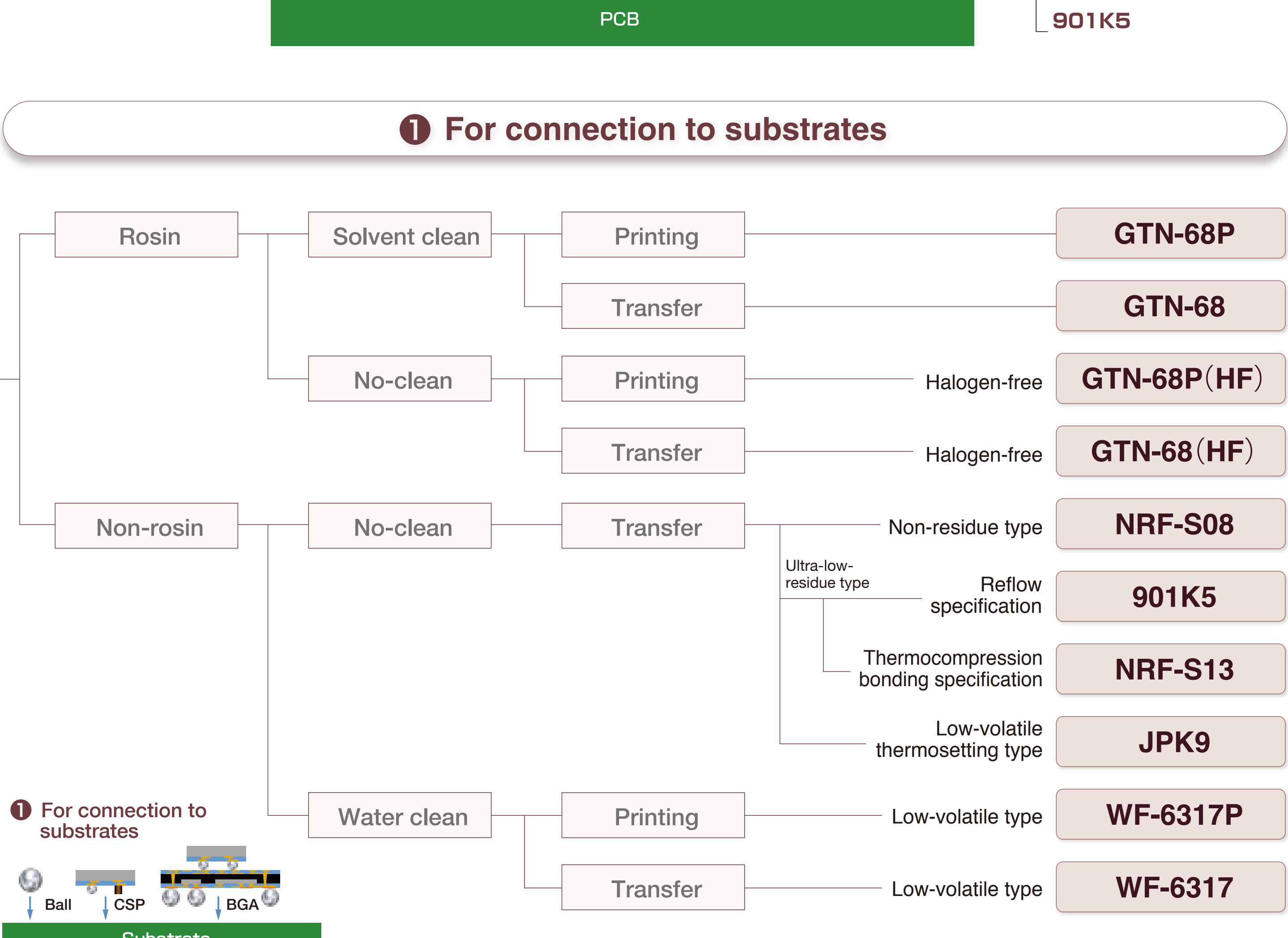
FLUX for SEMI-CONDUCTORS

Flux for semi-conductors is a liquid flux consisting of resins such as rosin, and activators or solvents

Choose products that are effective for soldering according to your purpose or application.

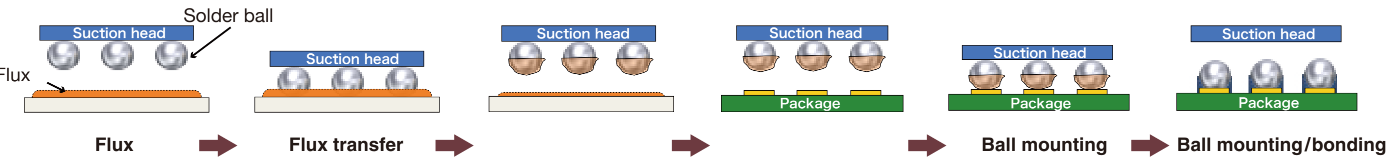


❶ For connection to substrates



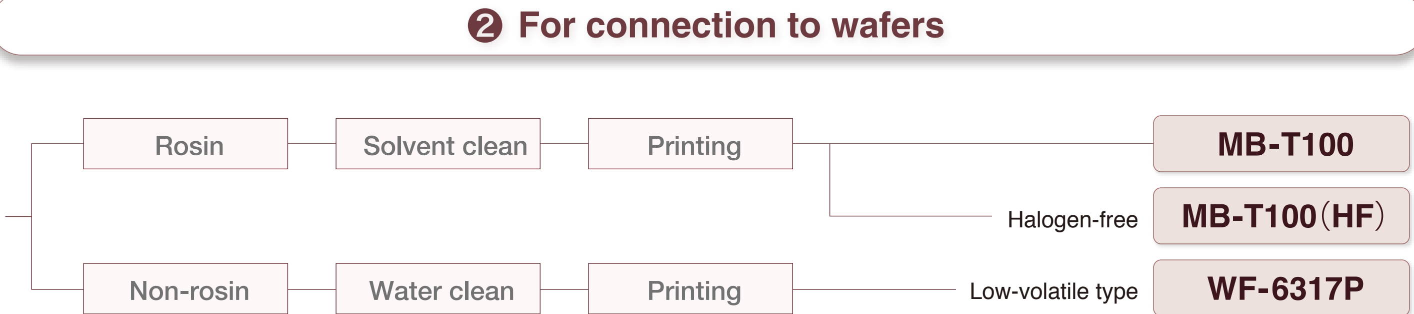
WF-6317 Low-volatile flux WF-6317 is a highly-active water-soluble flux with high heat resistance

Removes flux residue even by water cleaning, and realizes zero residue when cleaned with 40°C warm water.



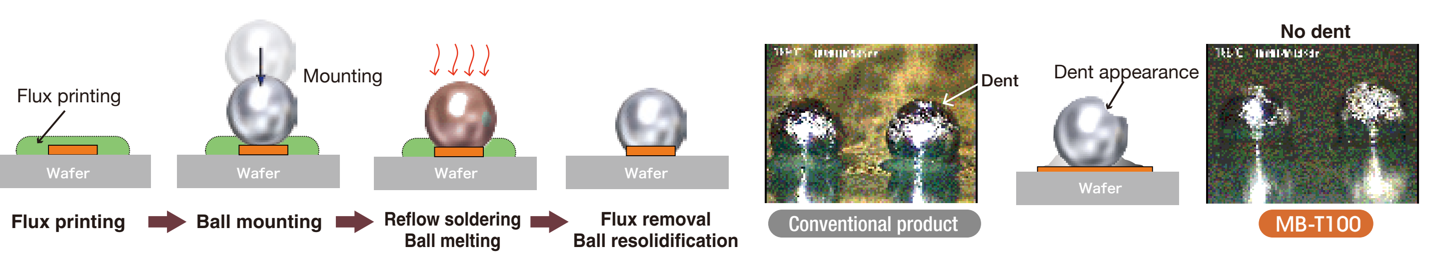
Contamination of the reflow oven is suppressed by the use of a low-volatile flux.

❷ For connection to wafers

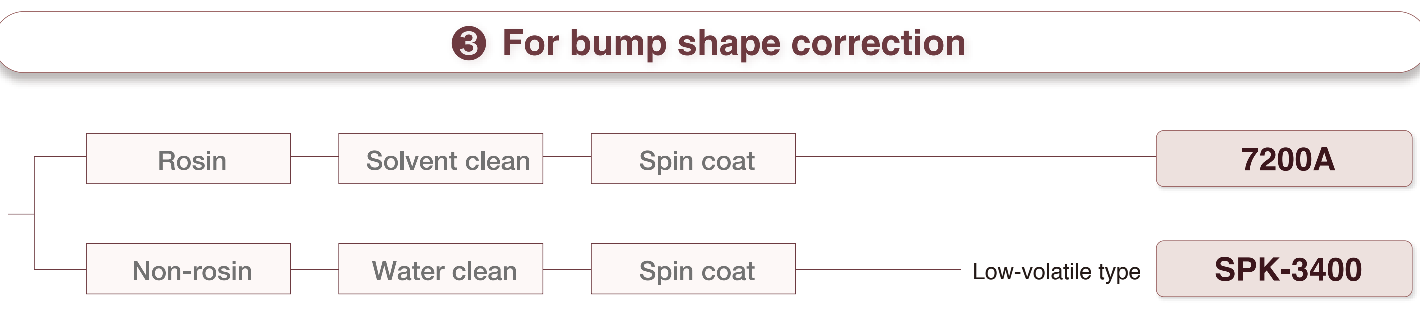


MB-T100 Highly-active MB-T100 reproduces dent-free spheres when balls are resolidified

Highly-active and exhibits high heat resistance, and can be cleaned with a semi-aqueous cleaning liquid.
A halogen-free product is also available.

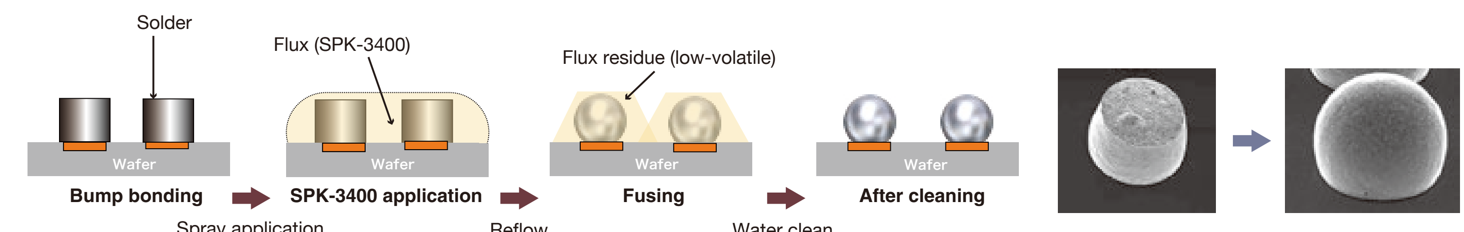


❸ For bump shape correction



SPK-3400 SPK-3400 forms even spherical bumps, and its flux residue can be removed by water-cleaning

A halogen-free flux that can be easily removed by water-cleaning even after high-temperature reflow soldering.



SMIC SOLUTION

SMIC offers a wide variety of solutions to respond to the requests of its customers

Semiconductor Solutions

3D PACKAGING

Cu Cored Ball

Passive component mounting
- Solvent clean Type5 solder paste **M10-PHW**
- Solder preform for replenishment **0402Type Chip Solder**
- Halogen-free ultra-fine wire flux cored solder **CBF**

Packaging
- Achieves both thermal fatigue/drop impact resistance **Solder Ball M770**
- Solder ball with high thermal fatigue resistance **M60 M758**
- Exhibits high shape retention capability **Cu Cored Ball**
- Solder paste for POP **NSV320 Series**
- Solder paste for joint reinforcement **JPP**
- Low-volatile water-soluble flux **WF-6317**

Component embedded mounting
- Ensures joints and spaces simultaneously **Cu Cored Ball**
- Maintains adhesion after re-heating **RAM Series**

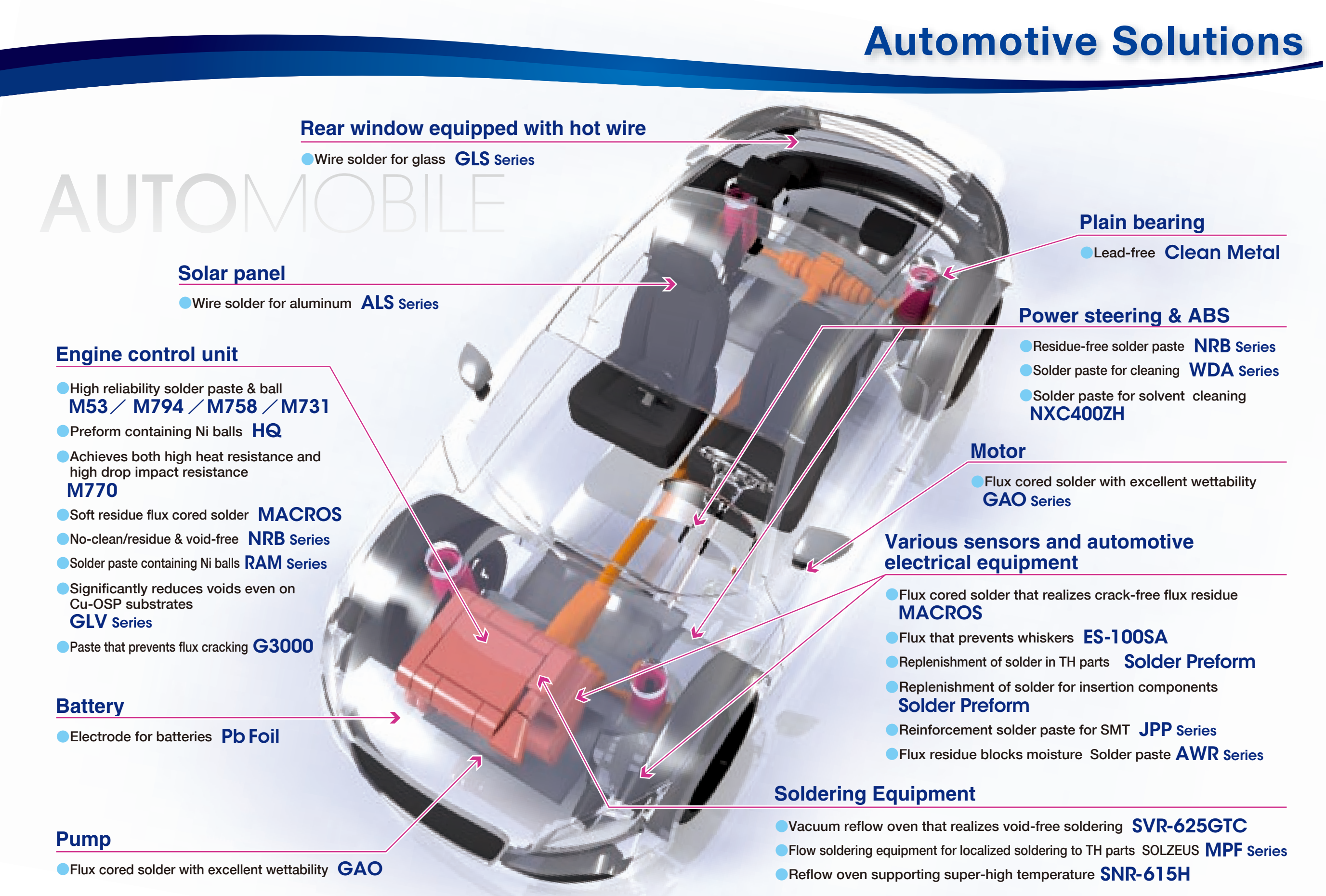
Semiconductor packaging
- Void prevention type no-clean solder paste **GLV Series**
- No-clean Type5 solder paste **M705-RGS800**

Bump formation
- Solder ball/LAS ball with a 100µm or smaller diameter **M705／M200**
- 100µm or smaller diameter **Cu Cored Ball／Cu Ball**
- Transfer solder sheet **PPS**
- Solder paste for micro-bump formation **M200-BPS**
- Flux for ball formation **MB-T100**

Ball attaching (ball connection)
- Solder paste/flux for POP **NSV320／GTN-68**
- Ultra-low residue flux **901K5**
- Water-soluble flux **WF-6317**
- Residue-free flux **NRF-S08**
- Joining material for copper pillars **PPS**

Soldering Equipment
- N2 reflow oven for semiconductor mounting **SNR-1346MB**
- Dust-free reflow oven **CX-430**
- Forms bumps with molten solder **IMS**

Automotive Solutions



AUTOMOBILE

Rear window equipped with hot wire
- Wire solder for glass **GLS Series**

Solar panel
- Wire solder for aluminum **ALS Series**

Engine control unit
- High reliability solder paste & ball **M53／M794／M758／M731**
- Preform containing Ni balls **HQ**
- Achieves both high heat resistance and high drop impact resistance **M770**
- Soft residue flux cored solder **MACROS**
- No-clean/residue & void-free **NRB Series**
- Solder paste containing Ni balls **RAM Series**
- Significantly reduces voids even on Cu-OSP substrates **GLV Series**
- Paste that prevents flux cracking **G3000**

Battery
- Electrode for batteries **Pb Foil**

Pump
- Flux cored solder with excellent wettability **GAO**

Plain bearing
- Lead-free **Clean Metal**

Power steering & ABS
- Residue-free solder paste **NRB Series**
- Solder paste for cleaning **WDA Series**
- Solder paste for solvent cleaning **NXC400ZH**

Motor
- Flux cored solder with excellent wettability **GAO Series**

Various sensors and automotive electrical equipment
- Flux cored solder that realizes crack-free flux residue **MACROS**
- Flux that prevents whiskers **ES-100SA**
- Replenishment of solder in TH parts **Solder Preform**
- Replenishment of solder for insertion components **Solder Preform**
- Reinforcement solder paste for SMT **JPP Series**
- Flux residue blocks moisture Solder paste **AWR Series**

Soldering Equipment
- Vacuum reflow oven that realizes void-free soldering **SVR-625GTC**
- Flow soldering equipment for localized soldering to TH parts SOLZEUS **MPF Series**
- Reflow oven supporting super-high temperature **SNR-615H**

High-Density Mounting Solutions

SMARTPHONE

Microscopic component mounting
- Supports 0201 components **M705-RGS800 Type6**

Medium-temperature substrate mounting
- For joint reinforcement **M705-JPP**
- Prevents non-wet failures **M705-RGS800**
- Supports microscopic components **M705-RGS800 Type6**

Cut-off fuse
- For safety and security of battery circuits **Solder Clad**

Component terminal plating
- Electrode for plating **Pureally Anode**
- Media for barrel plating **Solder Shot**

Narrow pitch connector mounting
- Flux cored solder with a 0.1 mm diameter **EFC**

Earphones
- High sound quality solder alloy

VCM (camera module)
- Flux cored solder with no residue cracking **FORTE**

Flexible substrate mounting
- Water-soluble solder paste **WSG36 Series**

Low temperature shield case mounting
- Low temperature Sn-Bi solder **L20／L27**
- **1005Type Chip Solder**
- Molten solder **Coat Case**
- For low temperature joint reinforcement **L20-JPP**

Solder replenishment for TH parts
- **Solder Preform**

Semiconductor packaging
- Solder ball for outer **M770**
- Solder paste for bump **BPS Series**
- Transfer solder paste **NSV320ZH**
- Super active flux **MB-T100**
- Ultra-low residue flux **901K5**
- Transfer flux DELTALUX **GTN-68**
- Transfer solder sheet supporting narrow pitches **PPS**

Environmental Solutions

Environmentally-friendly Products

ECOLOGY

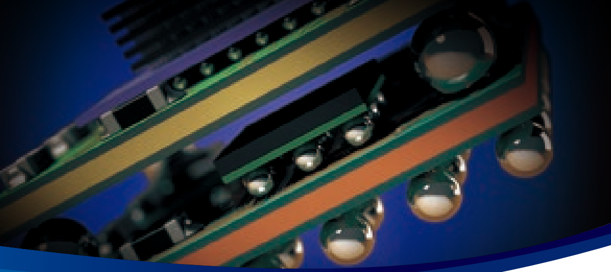
Effective resource utilization
- Prevents waste (dross) generation **Flow Solder MT/AP Series**
- Using reduced amounts or no rare metals **Low-Ag／No-Ag solder alloys**
- Recovers solder from dross at the manufacturing site **Solder Recycle Machine SDS-5N**
- Reduces wear of the solder iron tip **Wear Resistant Alloy M86**
- Reduces solder usage amount in microscopic component mounting **Micro Solder Balls**
- Reduces solder usage amount in microscopic component mounting **Type6, 7, 8 Solder Pastes**
- Extends the life of water pipes **Sn-Zn Alloy for Spraying**
- Resource recovery using solder recycling systems

Energy conservation (Climate change)
- Enables mounting at a low temperature range **Low Melting Point Lead-Free Alloy L20/L27**
- Enables mounting at a low temperature range **Low Melting Point Solder Paste LT142 Series**
- Enables mounting at a low temperature range **Low Melting Point Flux Cored Solder LEO Series**
- Reflow oven realized by a unique heat insulation structure **SNR-GT Series**
- Eliminates the need for a refrigerator **Room-Temperature Storable Paste S70GR**
- Realizes energy conservation by local heating **Solder Preform**
- Reduces work time by excellent wettability **Flux Cored Solder GAO Series**
- Enables energy conservation by laser mounting **Flux Cored Solder MACROS Series**
- Contributes to weight reduction of equipment **Solder for Aluminum Bonding ALS Series**

Chemical substance control
- Makes SMIC one of the world's leading companies **Lead-free products**
- Water clean solder paste that enables VOC prevention **Solder Paste WSG Series**
- Suppresses fumes or irritating odors and ensures good work environment **Flux Cored Solder GAO Series**
- No-clean solder paste that enables VOC prevention **No-Residue Solder Paste NRB Series**
- No-clean solder paste that enables VOC prevention, with flux residue that acts as an adhesive **Solder Paste JPP Series**
- No-clean solder paste that enables VOC prevention, with flux residue that acts as an adhesive **Flux JPK9**
- Prevents dioxin generation **Halogen-Free Products**
- All products are compliant with the new chemical substance control regulations **REACH Compliance** (Registration, Evaluation, Authorization and Restriction of Chemicals)
- Eliminates the need for cleaning solvents **Water-Soluble Flux Products**

Technologies of SMIC

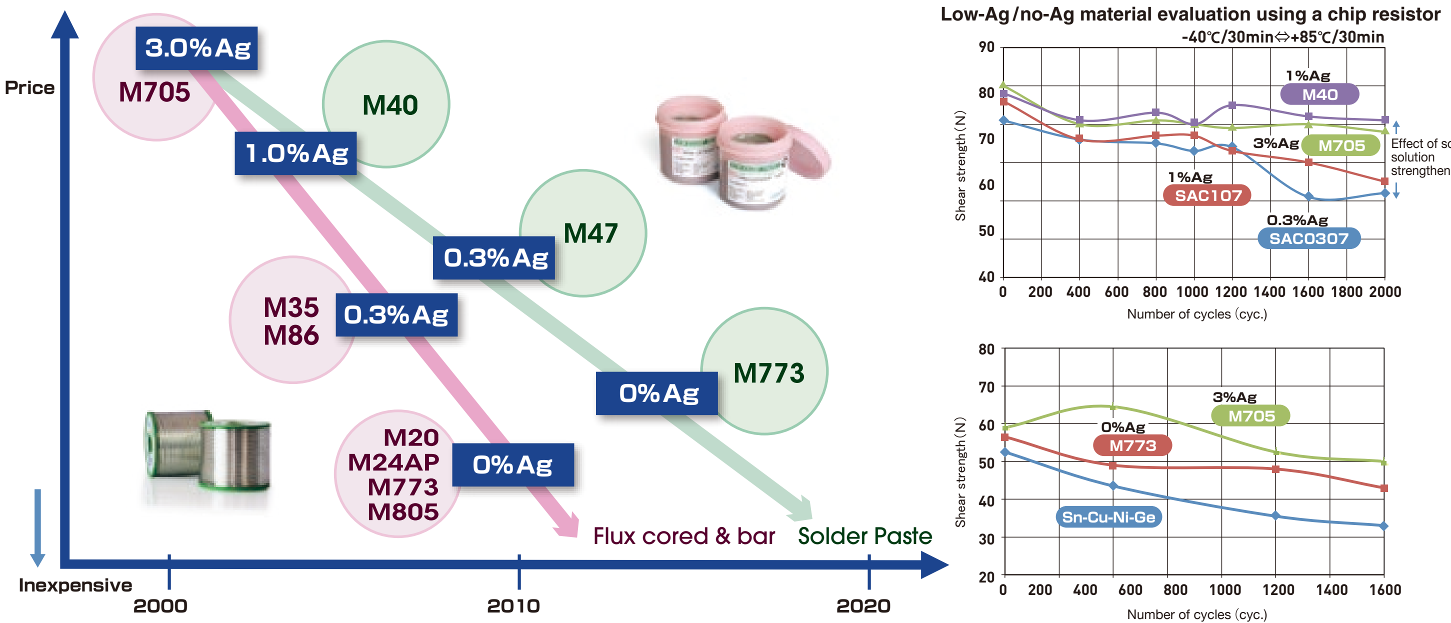
SMIC offers distinctive products to respond to requests of our customers



Low-Ag/No-Ag Technology

We have developed low-Ag/no-Ag solder alloys that achieve cost reduction

We have solved the issue of material strength in low or no-Ag materials through a combination of solid solution strengthening and precipitation strengthening technologies, and commercialized the resulting products.

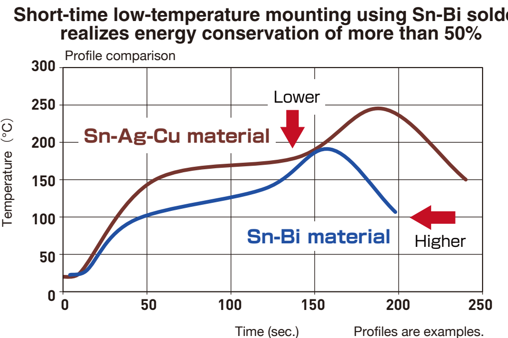


Short-time, low-temperature packaging technology

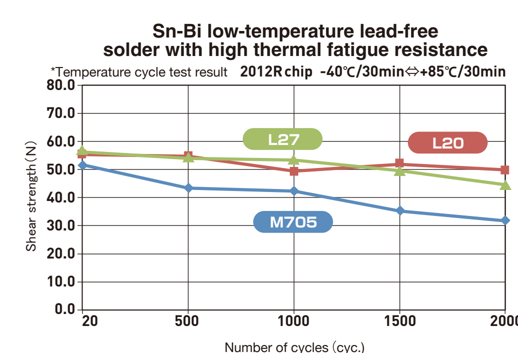
Short-time, low-temperature mounting enables the use of inexpensive low heat-resistant components or materials

A cost reduction is achieved by eco-friendly products that contribute to energy conservation in which mounting temperatures that have become higher in lead-free solders are made lower than those of conventional Sn-Pb solder. In addition, the JPP Series for joint reinforcement can increase joint strength and drop impact resistance.

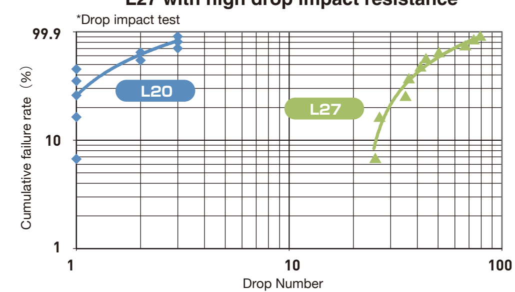
Short-time low-temperature mounting using Sn-Bi solder realizes energy conservation of more than 50%



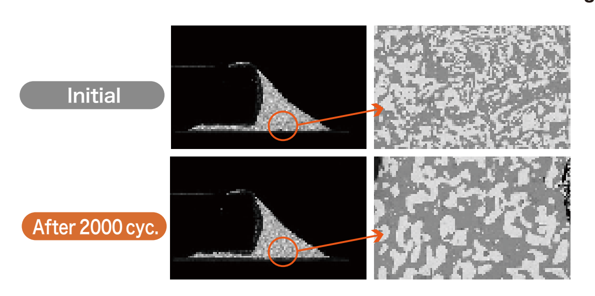
Sn-Bi low-temperature lead-free solder with high thermal fatigue resistance



L27 with high drop impact resistance

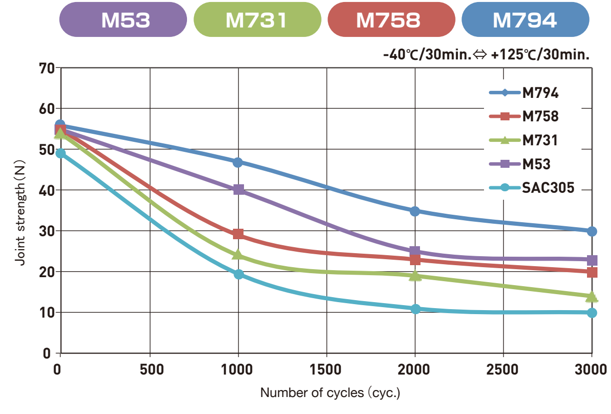


Joint cross section of L20 that enables excellent bonding



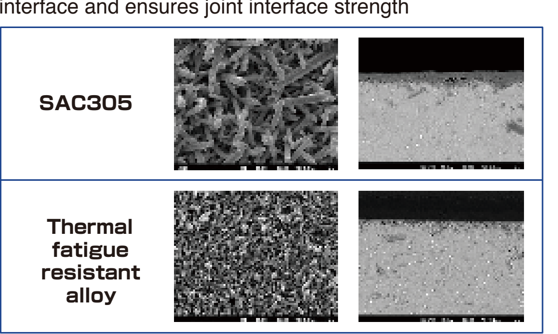
Thermal fatigue-resistant alloys

SMIC has developed cutting-edge thermal fatigue-resistant solder alloys using three novel technologies



【Joint interface reaction control technology】

Addition of Ni improves the fragile diffusion layer of the joint interface and ensures joint interface strength



【Precipitation strengthening and solid solution strengthening combination technology】

Precipitation strengthening

Strength enhancement by intermetallic compounds (Cu_6Sn_5, Ag_3Sn, etc.)

Sn phase

Intermetallic compounds (precipitation)

Compounds interposed at grain boundaries give pinning effects and suppresses deformation.

Enlarged to micron level

Solid solution strengthening

Strength enhancement by the formation of a solid solution with Sn (Sb/Bi/In, etc.)

Solid solution atom (solute atom)

Sn atom

Solute atoms are dispersed on an atomic level. Compared to the state in which atoms are arrayed (lined) homogenously, deformation is suppressed in the state in which foreign atoms are incorporated because of resistance.

Enlarged to atomic level

Solid solution status of the solute metals

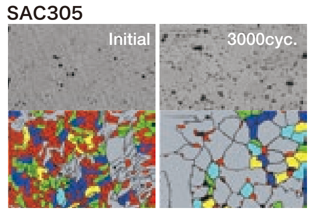
Status with no solute metals

【Sn grain coarsening suppression technology】

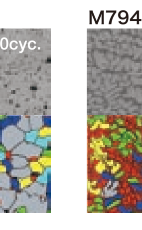
Through the addition of Ni/x, coarsening of crystal grains of Sn is suppressed at initial and after TCT.

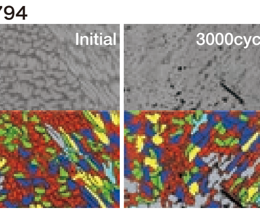
Coarsening of the Sn structure is suppressed by interposing different alloy atoms into the grain boundaries to prevent strength reduction and cracking

SAC305



M794

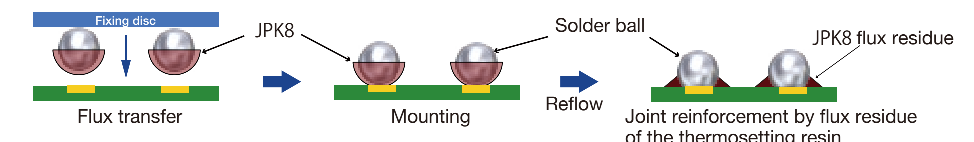




Flux residue working as an adhesive

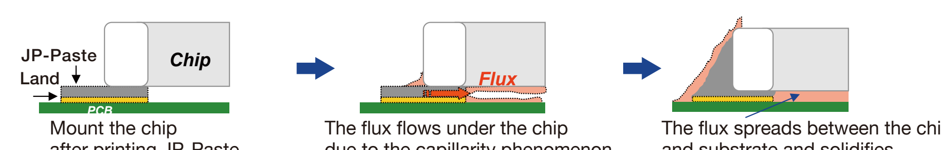
The technology that has changed the concept of soldering has achieved joint strength enhancement or drop impact reduction

Joint reinforcement of solder bumps by the JPK Series flux

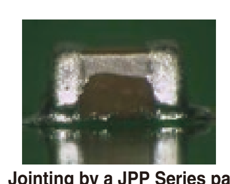


Jointing by JPK

The JPP Series flux is optimal for joint reinforcement of chip components and improvement of drop impact resistance of low melting point Sn-Bi solder

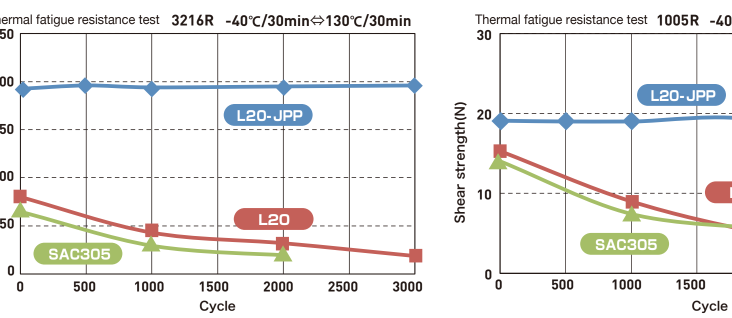


Jointing by a solder paste

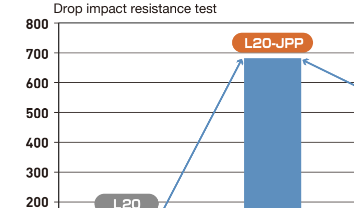


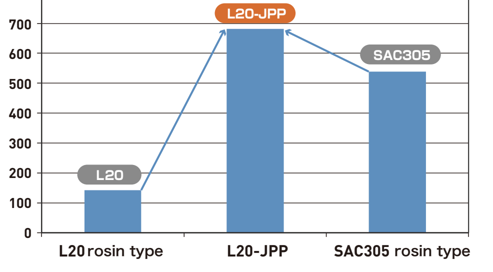
Jointing by a JPP Series paste

J20-JPP achieves better thermal fatigue resistance than that of SAC305



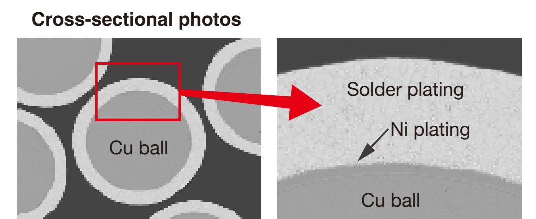
L20-JPP achieves approx. 5 times as much drop impact resistance as those of rosin type fluxes



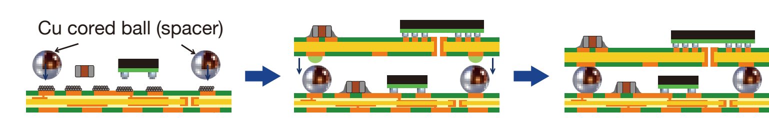


Cu Cored Ball

SMIC's advanced plating technology has allowed for easy securing of space in 3D mounting



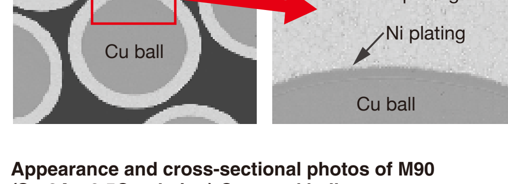
Usage example of Cu cored ball (3D mounting)



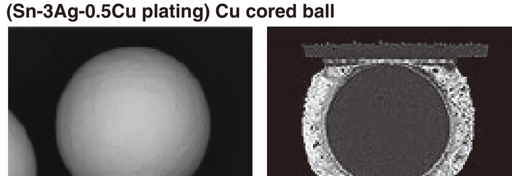
Features

	Suppression of electromigration	Securing of space	Heat dissipation
Solder ball	PKG / PCB	PKG / PCB (Inclination, Short)	PKG / PCB
Cu cored ball	Superior electromigration resistance	Secures adequate space	Cu has good thermal conductivity

Cross-sectional photos

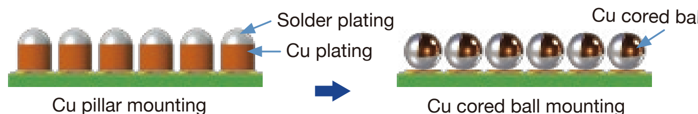


Appearance and cross-sectional photos of M90 (Sn-3Ag-0.5Cu plating) Cu cored ball



M90 improves drop impact resistance through reforming of the joint interface by Ni in the Ni plating.

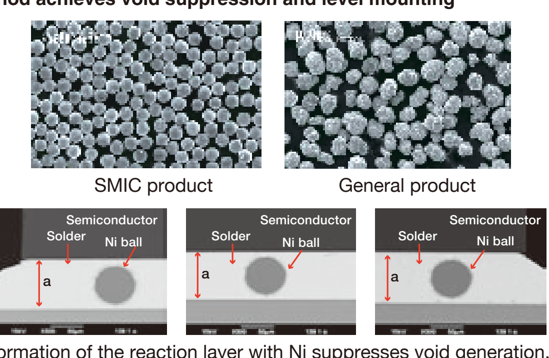
Usage example of Cu cored ball (substituting Cu pillar)



Solder Containing Ni Balls

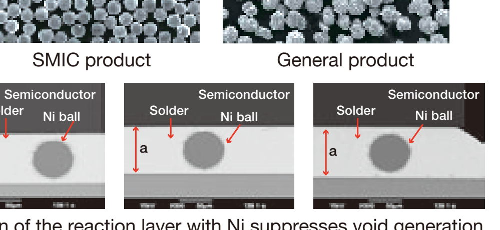
Realized by an outstanding Ni granulation technology, unique Ni inclusion technology, and a special surface processing technology

A good grain size distribution of Ni balls contained in preforms or solder pastes ensures level and even thickness, maximizing the heat dissipation effect.



A level die bond mounting realizes highly reliable wire bonding.

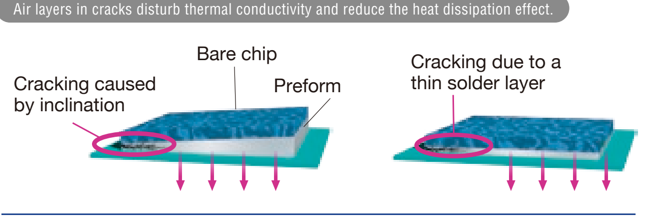
Spherical and uniform Ni ball produced by SMIC's unique production method achieves void suppression and level mounting



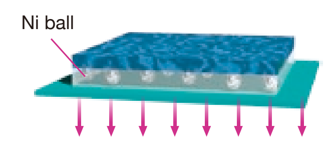
Formation of the reaction layer with Ni suppresses void generation, and all positions have nearly uniform thickness.

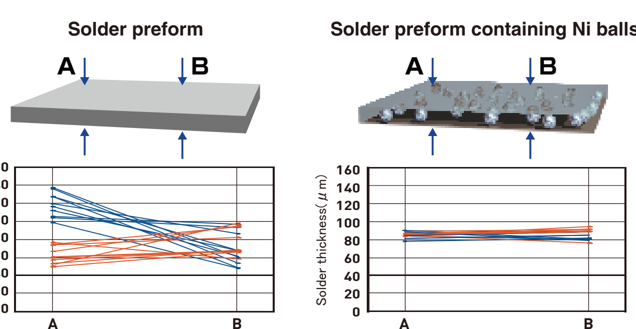
High heat dissipation

Air layers in cracks disturb thermal conductivity and reduce the heat dissipation effect.



Thickness is nearly the same at all positions

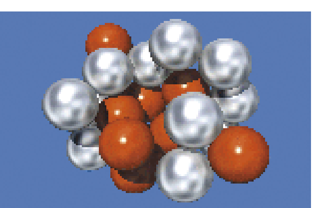




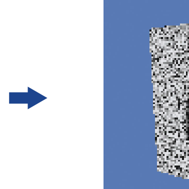
Alternative Paste to High-Temperature Solder

Composite technology realizes a solder paste that retains its shape after a repeated reflow processing, enabling hierarchical mounting

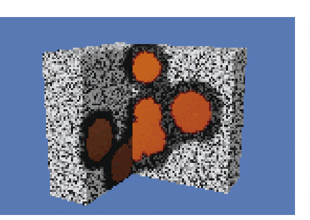
During the soldering process, a reaction occurs between the solder powder (Sn) and metal filler and the compound of Sn and the filler creates a network, partially achieving a high-temperature joint. The same mounting profiles as those for normal SnAgCu solder can be applied. Although the solder part melts again after re-heating at 270°C or higher, the compound layer at the high temperature joint retains its shape and prevents dropping of the component.



Before reflow

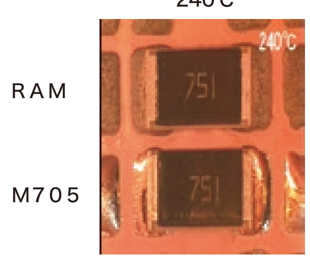
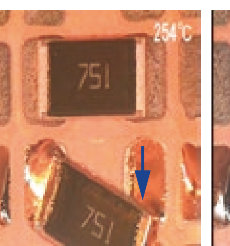
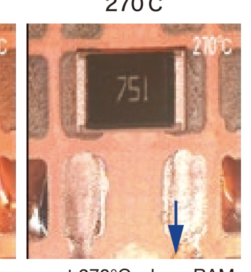


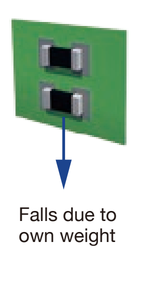
After reflow



Cross-sectional photo after reflow

Comparison of the component joint strength after repeated reflow processing

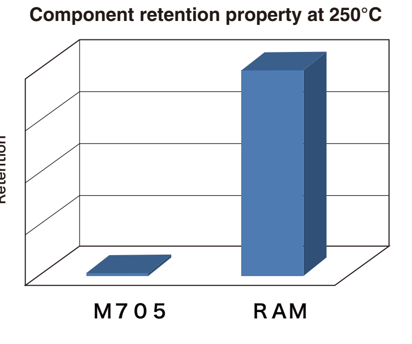






Falls due to own weight

The chip dropped where M705 was used, but it did not drop even at 270°C where RAM was used.

Component retention property at 250°C



Conflict Mineral Free

SMIC has declared its intention not to be complicit in environmental destruction, terrorist activities or human rights violations

All the supplier smelters have been checked by audits to deliver "conflict mineral free" products to our customers.

SMIC is the only company in the industry to participate in the EICC and to be declared "conflict free" as a CFSI member

As a CFSI member, we request that all supplier smelters participate in the Conflict-Free Smelter Program.

※EICC(Electronic Industry Citizenship Coalition):A CSR alliance in the electronic industry.
※CFSI(Conflict-Free Sourcing Initiative): An organization addressing the issue of conflict minerals.

Main alloys and product forms of ECO SOLDER

ECOSOLDER	Alloy composition (wt%)	Melting tem. (℃)			Form				
		Solidus line	Peak	Liquidus line	BAR	CORE	BALL	PASTE	PREFORM
M-series Peak temperature: 200℃ or higher									
M705	Sn−3.0Ag−0.5Cu	217	219	220	●	●	●	●	●
M30	Sn−3.5Ag	221	223	223	●	●	●	●	●
M31	Sn−3.5Ag−0.75Cu	217	219	219	●	●	●	●	●
M714	Sn−3.8Ag−0.7Cu	217	219	220	●	●	●	●	●
M715	Sn−3.9Ag−0.6Cu	217	219	226	●	●	●	●	●
M710	Sn−4.0Ag−0.5Cu	217	219	229	●	●	●	●	●
M34	Sn−1.0Ag−0.5Cu	217	219	227	●	●	●	●	●
M771	Sn−1.0Ag−0.7Cu	217	219	224	●	●	●	●	●
M35	Sn−0.3Ag−0.7Cu	217	219	227	●	●	●	●	●
M20	Sn−0.75Cu	227	229	229	●	●	●	●	●
M24MT	Sn−0.7Cu−Ni−P−Ge	228	230	230	●	●			●
M24AP	Sn−0.6Cu−Ni−P−Ge	227	228	228	●	●			●
M40	Sn−1.0Ag−0.7Cu−Bi−In	211	222	222		●		●	
M47	Sn−0.3Ag−0.7Cu−0.5Bi−Ni	216	228	228		●		●	
M773	Sn−0.5Bi−0.7Cu−Ni	225	229	229	●	●		●	
M805	Sn−0.3Bi−0.7Cu	225	229	229	●	●			
M53	Sn−3.0Ag−3.0Bi−3.0In	198	214	214				●	●
M794	Sn−3.4Ag−0.7Cu−3.2Bi−3.0Sb−Ni−x	210	221	221			●	●	●
M731	Sn−3.9Ag−0.6Cu−3.0Sb	221	224	226	●	●		●	●
M716	Sn−3.5Ag−0.5Bi−8.0In	196	208	214		●		●	
M10	Sn−5.0Sb	240	243	243	●	●	●	●	●
M14	Sn−10Sb	245	248	266	●	●	●	●	●
M709	Sn−0.5Ag−6.0Cu	217	226	378	●				
M760HT	Sn−5.0Cu−0.15Ni−x	228	229	365	●				
M711	Sn−0.5Ag−4.0Cu	217	226	344	●				
M60	Sn−2.3Ag−Ni−x	221	222	225			●		
M770	Sn−2.0Ag−Cu−Ni	218	220	224			●		
M758	Sn−3.0Ag−3.0Bi−0.8Cu−Ni	205	215	215		●	●	●	●
M84	Sn−3.0Ag−0.5Cu−Ni	219	223	324		●			
M85	Sn−0.3Ag−2.0Cu−Ni	218	231	332		●			
M86	Sn−0.3Ag−0.7Cu−Ni	220	232	330		●			
L-series Peak temperature: 200℃ or lower									
L20	Sn−58Bi	139	141	141	●	●	●	●	●
L27	Sn−40Bi−Cu−Ni	139	140	174	●	●	●	●	●

Peak temp. : Max. endothermic reaction point on DSC curve
Some alloy compositions may not be available in certain forms with special product sizes and grades.
For inquiries regarding alloy compositions not listed above, please contact us by e-mail.

Lead-free product Impurity standard (unit: percentage by mass)

Sb	Cu	Bi	Zn	Fe	Al	As	Cd	Ag	In	Ni	Au	Pb
0.07 or less	0.05 or less	0.05 or less	0.001 or less	0.02 or less	0.001 or less	0.03 or less	Less than 0.002	0.03 or less	0.02 or less	0.01 or less	0.005 or less	Less than 0.05

Automated Soldering Equipment

Reflow Ovens

Convection Energy-saving Design — Nitrogen Atmosphere

Convection Oven — SNR-GT

Built for superior energy-conservationand high productivity

SNR-GT Ser.

Superior energy-saving and highly productive general purpose reflow oven

Vacuum Convection Oven — SVR

Drastic void reduction by the vacuum zone in the heating section

SVR Ser.

Void-free design by knowledge of solder material characteristics

Semiconductor Application Design — Nitrogen Atmosphere

Far-Infrared Oven — CX

Dust-free clean design

CX-430

Clean furnace with minimal amount of dust: the most optimal for solder ball mounting on wafers

Far Infrared Radiant Heat/ Convection Oven — SNR

Small-size oven compatible with low oxygen concentration

SNR-615 Ser.

The H specification product can accommodate profiles up to 420°C and is optimal for die bonding of power devices

Flow Soldering Machines

Wave Solder

Air Atmosphere — SPF2

Nitrogen Atmosphere — SPF2-N

Stable pressure type automatic soldering machine

ECOPASCAL SPF Ser.

Energy-saving Automatic Stable Pressure Flow (SPF) soldering system

Selective Wave Machine — Nitrogen Atmosphere

Inline type — MPF-2003ST

Round type — MPF-2007ST

Static pressure type local soldering machine

SOLZEUS MPF Ser.

Static pressure type local soldering machine realizes energy conservation and high quality soldering