HIGH SPEED PRINTING, NO CLEAN, PIN TESTABLE SOLDER PASTES

MP100

Multicore MP100 medium has been formulated as a pale, soft residue product for printing and reflow in air, where process yield is critical. MP100 solder pastes offer excellent open time, greatly extended abandon times and good soldering activity over a wide range of reflow profile types and surface finishes.

- **Effective over a wide range of printer cycle times and squeegee speeds**
- **Excellent printer open time and between-print abandon time**
- **Highly suitable for enclosed squeegee systems**
- **Long component tack time**
- **Resists solder balling**
- **Excellent spread on a wide range of solderable surfaces**
- **Effective over a wide range of reflow profiles in air or nitrogen**
- **Soft, non-sticky post reflow residues for reduced maintenance in-circuit electrical testing**
- **Low colour post reflow residues for easy visual inspection**

PRODUCT RANGE

STENCIL PRINTING SOLDER PASTES			
Product Category	Anti-Tombstone	Standard Alloy	Standard alloy, enclosed squeegee
Alloy Code	63S4	Sn62	Sn62
Alloy Melting Range, °C	179-183	179	179
Particle Size Distribution Multicore Code Ansi/J-STD-005 Nominal Size Range, µm	 ACS - 45-10	 AGS Type 3 45-20	
Metal Content, wt%	89.5	89.5	90
Brookfield Viscosity, cP	670,000	660,000	700,000

RECOMMENDED OPERATING CONDITIONS

Application: All MP100 products are designed for high volume stencil printing applications with component lead pitches down to 0.4mm. Finer pitches may require that the paste is formulated with finer powder, although print capability down to 0.3mm has been demonstrated. Conventional metal blade squeegees may be used with a contact angle of 60° and sweep speeds of 20mm sec–1 up to 150mm sec–1. The best printing performance will be obtained under these conditions and users are recommended to increase the squeegee speed if it is below the lower limit. The products will however tolerate slow print cycle times because the material resists drying on the stencil and blocking the apertures. There are various methods for testing the ability of a paste to perform after an extended idle time on the stencil and each can produce different times before printing deteriorates. In a real process environment, the paste has been left idle for more than 1 hour and still produced a perfect first print for 0.4mm pitch pads at 150mm sec–1 squeegee speed.

The products shown above are suitable for application by enclosed squeegee systems and this may increase the printing process window. In common with many paste formulations, increasing the metal content by 0.5 wt% may produce improved performance with the enclosed squeegee systems but this has a detrimental effect on performance with conventional squeegees.

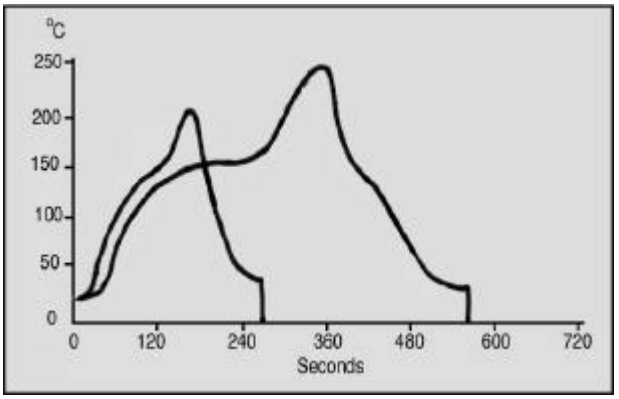
The relatively low print pressure required by MP100 solder paste facilitates second side printing where supporting the board on the populated side may be difficult.

Users should be aware that paste release from stencil apertures is excellent and may be greater than products previously used on the same stencils. It produces deposits with more consistent paste volume and paste height. Stencil aperture size may previously have been optimised to deal with products that have inferior release characteristics and so the volume of paste deposited with MP100 may be slightly greater. Normally, this will be within the printing process window but it may produce a greater risk of mid-chip solder balling. Reducing aperture openings will compensate for this effect.

Misprinted boards and stencils may be cleaned with normal proprietary cleaning solvents including Multicore Prozone SC-01 and SC-02 solvent cleaners.

Component Placement: The pastes show good tack behaviour and are capable of holding components in place before reflow. Components may be placed several hours after printing, although this is naturally dependent on the ambient conditions. Once components are placed, the boards may be left for several hours before reflow without impact on the defect levels, depending on the previous history of the printed board.

Reflow Profile: MP100 solder pastes have been formulated for reflow in air over a wide range of temperature profiles. The diagram below shows two extreme reflow profiles that have been used successfully for the products formulated with Sn62



and 63S4 alloys. Any combination of conditions between these extremes may be used and profiles outside the range shown may give good results, depending on board design factors.

As with all solder pastes, reflow of these products may be carried out in nitrogen if this is installed but there is unlikely to be any significant effect on defect rates.

Soldering: The flux in MP100 is formulated to give excellent wetting on all common board and component lead finishes, including OSP copper that may have been passed through multiple reflow processes in air.

Sn62 solder alloy pastes produce bright, shiny joints while those from the anti-tombstone alloy may be slightly less bright. The effect is marginal and is due to the small melting temperature range of the alloy.

The solder pastes have a very low tendency to solder balling during reflow and the presence of microballs on a finished assembly is a strong indication of a process related problem.

Residues: The residues from all MP100 solder pastes are intended to be left on completed assemblies without cleaning. They are designed to pass the normal industry Surface Insulation Resistance, Electromigration and Ionic Contamination tests as well as specific customer Accelerated Life tests. They also have very low colour after reflow and this provides a pleasing appearance for finished assemblies and may be beneficial for auto-inspection equipment.

Where cleaning is required, users are advised to evaluate the compatibility of solder paste, reflow profile, cleaning material and cleaning process. Good results are likely to be achieved with popular cleaning materials and effective process equipment.

If electrical testing is to be carried out, the residues of MP100 may be probed with minimal risk of false failures and contact tip contamination. The residues of MP100 are soft but not sticky but they are non-conductive and probe maintenance is an integral part of a successful electrical test process.

The residues from MP100 may be conformally coated but the combination of materials and end use exposure conditions means that customers are advised to evaluate specific materials and process combinations.

GENERAL PROPERTIES

Solder Powder: The solder powder for Multicore MP100 solder pastes is produced by atomising alloys conforming to the purity requirements of ANSI/J-STD-006 and EN29453. Sn62 alloy meets the composition requirements of these specifications while the anti-tombstoning alloy 63S4 meets the specification of Sn63 except for a deliberate addition of 0.4% silver.

Careful control of production processes ensures that the solder powder is at least 97% spherical (aspect ratio < 1.5) and contains less than the minimum level of contaminants that would adversely affect solder paste performance. A typical maximum oxide contamination level of 80 ppm (expressed as oxygen in the solder) is regularly achieved or bettered.

Solder Paste Medium: Multicore MP100 contains a stable resin system and solvents with high boiling ranges. The flux has been formulated to meet the requirements of IPC type LR3CN and the Bellcore specification.

Test	Specification	Results
Corrosion	DTD 599A IPC-SF-818 BS5625	Pass
Copper Mirror Corrosion	IPC-SF-818	Pass
Chromate Paper Test	IPC-SF-818	Pass
Surface Insulation Resistance (without cleaning)	IPC-SP-819 J-STD-004 Bellcore TR-NWT-000078	Pass
Electromigration (without cleaning)	Bellcore TR-NWT-000078	Pass
Flux Activity Classification	IPC-SF-818 J-STD-004 EN 29454	LR3CN ROLO 1.1.2

Solder Paste: The properties of a solder paste depend in part on the metal content, the solder alloy and the solder powder particle size range. In general terms, increasing metal content reduces the tendency to slump and reduces the tack life of the solder paste while the solder balling performance improves. Typical properties of selected Multicore MP100 solder pastes are as follows. Full details of test methods will be supplied on request.

STENCIL PRINTING SOLDER PASTES		
Product Category	Anti-tombstone	Standard alloy
Alloy Code	63S4	Sn62
Alloy Melting Range, °C	179-183	179
Particle Size Distribution		
Multicore Code	ACS	AGS
Ansi/J-STD-005	–	Type 3
Nominal Size Range, µm	45-10	45-20
Metal Content, wt%	89.5	89.5
Viscosity		
Brookfield, cP (1)	670,000	660,000
Malcom, P (2)	1,370	1,550
Thixotropic Index (3)	0.71	0.70
Slump, (4) IIW Test Method, mm		
1 Hour @ room temperature		
0.7mm pads	0.2	0.2
1.5mm pads	0.2	0.2
20 minutes @ 80°C		
0.7mm pads	0.2	0.2
1.5mm pads	0.2	0.2
Slump, (4) IPC Test Method		
Room temperature		
0.63mm pads horizontal/vertical	0.33/0.33	0.33/0.33
0.23mm pads horizontal/vertical	0.06/0.10	0.06/0.06
150°C		
0.63mm pads horizontal/vertical	0.41/0.48	0.41/0.48
0.23mm pads horizontal/vertical	0.06/0.10	0.06/0.10
Tack (5)		
Initial tack force, g mm^{-2}	1.21	1.36
Useful open time, h	>72	>72

(1) *Measured at 25°C, TF spindle at 5rpm after 2 minutes.*
(2) *Measured at 25°C and a shear rate of 6s-1 (PCU-205 model)*
(3) *The Thixotropic Index (TI) is defined as: TI=log (viscosity at 1.8s-1/viscosity at 18s-1) (PCU-205 model)*
(4) *The slump data are expressed as the minimum spacing between pads of the size shown that does not allow bridging.*
(5) *Tack data are derived from comparative laboratory tests and do not necessarily relate directly to particular user conditions.*

PACKAGING

Containers: Multicore MP100 solder pastes are supplied in:

- 1 kg, 500g or 250g plastic jars with an insert to seal off the surface of the paste
- 1 kg, 650g or 500g vacuum filled cartridges for direct application
- 750g Proflow cassettes

Other forms of packaging may be available on request.

Shelf Life: Providing Multicore MP100 solder pastes are stored at 5-10°C tightly sealed in the original container, a minimum shelf life of 6 months can be expected. Air shipment is recommended to minimise the time the containers are exposed to higher temperatures.

Multicore MP100 solder pastes have been formulated to reduce separation on storage to a minimum but should it occur, gentle stirring for 15 seconds will return the products to their correct rheological performance.

HEALTH AND SAFETY

WARNING: The following information is for guidance only and users must refer to the Material Safety Data Sheet relevant to specific Multicore MP100 solder paste products before use.

Fumes, Vapours and Precautions: The flux fumes given off at soldering temperatures are irritating to the nose, throat and respiratory organs. Prolonged or repeated exposure to the fumes may cause sensitisation.

These materials should always be used in a well ventilated area and suitable fume extraction should be used to extract flux fumes away from the operators.

Protection and Hygiene: Suitable protective clothing should be worn to prevent materials from coming into contact with the skin and eyes. If the materials come into contact with the skin, the affected area should be cleaned with a proprietary hand cleanser followed by washing with soap and water. If the materials come into contact with the eyes, they should be irrigated thoroughly with running water for at least 10 minutes and medical attention sought.

Eating, drinking or smoking should not be permitted in the working area and hands should be washed thoroughly with soap and warm water before eating.

Fire Hazards and Precautions: The flashpoint of the solvent used in these materials is high (118°C) but it is combustible. Carbon dioxide, foam or dry powder extinguishers are suitable. High temperatures may produce heavy metal dust, fumes and/or vapours. Do not use water where molten metal is present.

Spillage and Waste Disposal: Spills of the materials should be scraped up and the contaminated area washed with water. Waste materials should be stored in closed containers and disposed of in accordance with the relevant local and national regulations.