Product Data Sheet

# MP100

May 2007

**HIGH SPEED PRINTING, NO CLEAN, PIN TESTABLE SOLDER PASTES**

**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**
- **Version suitable for ultra-fine pitch and 0201 chips**
- **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**

## RECOMMENDED OPERATING CONDITIONS

**Application:** MP100 solder pastes containing Type 3 (AGS) solder powder are formulated for high volume stencil printing applications with component lead pitches down to 0.4mm. Print capability of these products down to component lead pitches of 0.3mm has been demonstrated.

Improved print definition and consistency will be obtained for assemblies having 0201 passive and 0.5mm pitch array packages if the slightly finer powder grades ADP or ACP (only with 63S4 anti-tombstone alloy blend) are selected. These powder sizes produce better printing performance on such assemblies than the finer Type 4 powder without sacrificing the reflow process window.

Conventional metal blade squeegees may be used with a contact angle of 60° and sweep speeds of $20mms^{-1}$ up to $150mms^{-1}$. 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 below 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. MP100 products for enclosed head squeegee systems should be specified at the time of ordering since they are prepared and packed to ensure optimum performance in this type of equipment.

## PRODUCT RANGE

| PRINTING SOLDER PASTES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Product Category | Standard alloy | | Standard alloy | | Standard alloy, enclosed head printing | | Standard alloy, ultra-fine pitch | | Anti-tombstone |
| Alloy Code | Sn62 | Sn63 | Sn62 | Sn63 | Sn62 | Sn63 | Sn62 | Sn63 | 63S4 |
| Alloy Melting Temperature | 179°C | 183°C | 179°C | 183°C | 179°C | 183°C | 179°C | 183°C | 179-183°C |
| Particle Size Distribution<br>Multicore Code<br>ANSI/J-STD-005<br>Nominal Size Range/µm | AGS<br>Type 3<br>45-20 | | | | | | ADP<br>-<br>38-15 | | ACP<br>-<br>38-10 |
| Metal Content, wt% | 89.5 | | 90.0 | | 90.0 | | 90.0 | | 90.0 |
| Brookfield Viscosity/cP | 610,000 | | 680,000 | | 800,000 | | 700,000 | | 740,000 |



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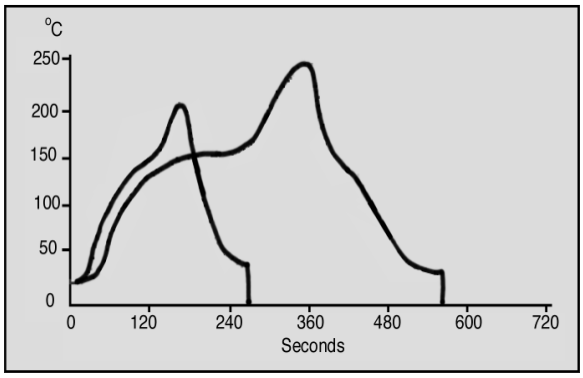
The relatively low print pressure required by MP100 solder paste facilitates second side printing where supporting the board on the populated side may be difficult.

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 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:** 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. Where tombstone defects are experienced with standard alloys and it is not possible to eliminate them by design changes, it is recommended that the anti-tombstone powder blend be selected. This is preferable to attempting to eliminate the defect by adjusting the reflow profile.

**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 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<br>IPC-SF-818<br>BS5625 | Pass |
| Copper Mirror Corrosion | IPC-SF-818 | Pass |
| | | |
| | | |
| Chromate Paper Test | IPC-SF-818 | Pass |
| Surface Insulation Resistance (without cleaning) | IPC-SP-819<br>J-STD-004<br>GR-78-CORE | Pass |
| Electromigration (without cleaning) | GR-78-CORE | Pass |
| Flux Activity Classification | IPC-SF-818<br>J-STD-004<br>EN 29454 | LR3CN<br>ROLO<br>1.1.2 |

| STENCIL PRINTING SOLDER PASTES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Product Category** | **Standard alloy** | | **Standard alloy** | | **Standard alloy, enclosed head printing** | | **Standard alloy, ultra-fine pitch** | | **Anti-tombstone** |
| **Alloy Code** | Sn62 | Sn63 | Sn62 | Sn63 | Sn62 | Sn63 | Sn62 | Sn63 | 63S4 |
| **Alloy Melting Temperature** | 179°C | 183°C | 179°C | 183°C | 179°C | 183°C | 179°C | 183°C | 179-183°C |
| **Particle Size Distribution**<br>**Multicore Code**<br>**ANSI/J-STD-005**<br>**Nominal Size Range, µm** | AGS<br>Type 3<br>45-20 | | | | | | ADP<br>-<br>38-15 | | ACP<br>-<br>38-10 |
| **Metal Content/wt%** | 89.5 | | 90.0 | | 90.0 | | 90.0 | | 90.0 |
| **Brookfield Viscosity/cP**[1] | 610,000 | | 680,000 | | 800,000 | | 700,000 | | 740,000 |
| **Malcom Viscosity/p**[2] | 1350 | | 1540 | | 1660 | | 1600 | | 1720 |
| **Thixotropic Index**[3] | 0.66 | | 0.68 | | 0.67 | | 0.70 | | 0.64 |
| **Slump**[4] **IIW Test Method**<br>**Room Temperature**<br>**0.7mm pads**<br>**1.5mm pads**<br>**20 minutes @ 80°C**<br>**0.7mm pads**<br>**1.5mm pads** | <br><br>0.2<br>0.2<br><br>0.2<br>0.2 | | <br><br>0.2<br>0.2<br><br>0.2<br>0.2 | | <br><br>0.2<br>0.2<br><br>0.2<br>0.2 | | <br><br>0.2<br>0.2<br><br>0.2<br>0.2 | | <br><br>0.2<br>0.2<br><br>0.2<br>0.2 |
| **Slump, IPC Test Method**<br>**Room Temperature**<br>**0.63mm pads**<br>**0.23mm pads**<br>**150°C**<br>**0.63mm pads**<br>**0.23mm pads** | <br><br>0.33 / 0.33<br>0.06 / 0.10<br><br>0.41 / 0.48<br>0.06 / 0.10 | | | | | | | | |
| **Tack** [5]<br>**Initial tack force/g mm**$^{-2}$<br>**Useful open time (hrs)** | 1.4<br>>72 | | 1.1<br>>72 | | 1.1<br>>72 | | 1.2<br>>72 | | 1.1<br>>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.***

**Solder Paste:** The properties of a solder paste depends in part of 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 shown in the table above. Full details of test methods will be supplied on request.

## PACKAGING

**Containers**: Multicore MP100 solder pastes are supplied in:

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

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.

It is recommended that cartridges of MP100 are stored vertically with the cartridge tip facing downwards.

## GENERAL INFORMATION

**For safe handling information on this product, consult the Material Safety Data Sheet, (MSDS).**



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