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XCE 3104XL Technical Data Sheet

Electrically Conductive Adhesive with Tin Compatibility For fine Stencil and Screen Print Applications

Key Feature:	Benefit:
• Controlled particle size	• Improved fine pitch printing capability
• Superior contact resistance on Sn, Sn/Pb, OSP coated Cu and nickel/gold	• Reliable SMD assemblies
• Extra long stencil work life at high print speed	• Minimizes product waste and stencil clean-up; increases efficiency
• Cures at 125°C & through solder reflow	• Compatible with all flex substrates & existing SMT assembly lines
• Lead free	• No lead, lead reclamation, or flux residue cleaning required

Product Description:

XCE 3104XL won the SMT Vision Award in 2002 in the best adhesive/encapsulant/coating category.

XCE 3104XL is a one component, thermosetting, electrically conductive adhesive that is a lead-free alternative to solder for surface mount device (SMD) interconnect formation. XCE 3104XL will cure completely at low temperatures or following a typical eutectic solder reflow cycle, with no post cure required. XCE 3104XL can run on existing SMT lines – no new equipment is needed. XCE 3104XL also provides extra long stencil work life at high print speeds. This feature allows the user to minimize product waste and stencil clean-up time, thus increasing production efficiency.

XCE 3104XL uses a unique blend of fillers with tightly controlled particle sizes to provide fine pitch stencil and screen printing performance using standard SMT equipment. XCE 3104XL cures completely using a typical solder eutectic reflow cycle or at lower temperatures when required. No post cure is needed. As a result, XCE 3104XL is highly compatible with existing SMT assembly processes.

This product allows for exceptional fine pitch resolution and an environmentally favorable and simplified SMT process by eliminating lead, lead reclamation, solder paste residues, flux residue cleaning, and high-temperature reflow cycles.

XCE 3104XL is intrinsically clean. This means no significant VOC and no residuals. The low Coefficient of Thermal Expansion (CTE) of XCE 3104XL results in exceptional thermo-mechanical junction reliability vs. solder.

XCE 3104XL also provides extra long stencil work life (greater than one shift) at high print speeds. This feature allows the user to minimize product waste and stencil clean-up time, thus increasing production efficiency.

Applications:

XCE 3104XL adhesive is capable of fine pitch resolution (less than 20 mil) when printed using a metal mask stencil. This product is also printable using a stainless steel mesh screen. This adhesive may be used with tin, tin/lead, OSP-copper and nickel/gold printed circuit board metallizations.

Cure:

XCE 3104XL may be cured in a batch oven at low temperatures or in a standard reflow oven. Because the XCE 3104XL solder alternative cures completely during a typical reflow cycle, no post cure operation is required.

Instructions For Use:

Thoroughly read the information concerning health and safety contained in this bulletin before using. Observe all precautionary statements that appear on the product label and/or contained in individual Material Safety Data Sheets (MSDS).

Properties of Material As Supplied:

Property	Test Method	Unit	Value
Chemical Type			Epoxy
Appearance	Visual		Silver Paste
Brookfield Cone and Plate Viscosity	5.0 rpm # CP-52	Pa.s cP	54 54,000
	Shear Thinning Index	NA	4.9
Pot Life	Static	Days	2

Cure Schedule:

XCE 3104XL may be cured in a reflow oven, with a typical reflow cycle or lower-temperature modified cycle. Alternatively, it may also be cured in a convection oven. No post cure is required.

Recommended Cure Condition	Condition Description/Oven
Cure Option 1	15 minutes @ 125 °C — Batch Cure
Cure Option 2	10 minutes @ 150 °C --- Batch Cure

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Properties of Material After Application:

Property	Test Method	Unit	Value
Glass Transition (Tg) Thermal Mechanical Analysis(TMA) Dynamic Mechanical Analysis(DMA) Storage Modulus Peak Tan Δ	10°C/minute 3°C/minute Ramp,1 Hz Frequency, 40u Amplitude	°C °C °C	109 116 136
Modulus at 25°C at 150°C	3°C/minute,1 Hz, 40u	GPa	6.6 0.4
Coefficient of Thermal Expansion (CTE) Below Tg Above Tg	10°C/minute	ppm ppm	46 160
Volume Resistivity @ 25°C	TP-183	Ohm-cm	0.0005
Thermal Conductivity	Laser Flash	W/mK	1.8
Die Shear Strength	100 mil x 100 mil Silicon Die on Aluminum Lead Frame	kg	>28
Component Shear Strength	0805 Sn/Pb resistors, Avg. of 30 resistors • on OSP Cu pads • on Au/Ni pads	kg kg	6.9 6.7
Ionics Chloride Sodium Potassium	Teflon Flask, 5 gm Sample/20-40 Mesh, 50 gm DI Water, 100°C for 24 Hours	ppm ppm ppm	<50 <10 <5

TPs are internal test procedures, typically derived from ASTM or other norms. Copies of these test procedures can be obtained upon request.

Performance & Reliability Data:

Property	Test Method	Unit	Value
Contact Resistance on OSP-coated Cu pads FR-4 substrate **Initial and after 85%RH/85°C**	4 mil Print on Daisy Chain pattern populated with 0805 Sn/Pb null Ohm resistors	mOhm Single Joint Contact Resistance, Avg. of 100 joints	Initial: 16 After 1000 hours: 16
Contact Resistance on OSP-coated Cu pads FR-4 substrate **Initial and after 125°C aging**	4 mil Print on Daisy Chain pattern populated with 0805 Sn/Pb null Ohm resistors	mOhm Single Joint Contact Resistance, Avg. of 100 joints	Initial: 17 After 1000 hours: 14
Contact Resistance on Au/Ni pads FR-4 substrate **Initial and after 85%RH/85°C**	4 mil Print on Daisy Chain pattern populated with 0805 Sn/Pb null Ohm resistors	mOhm Single Joint Contact Resistance, Avg. of 100 joints	Initial: 16 After 1000 hours: 16
Contact Resistance on Au/Ni pads FR-4 substrate **Initial and after 125°C aging**	4 mil Print on Daisy Chain pattern populated with 0805 Sn/Pb null Ohm resistors	mOhm Single Joint Contact Resistance, Avg. of 100 joints	Initial: 15 After 1000 hours: 16

Storage and Handling:

The shelf life of XCE 3104XL is 6 months at -40°C. For best results store in original, tightly covered containers. Storage in a clean and dry area is recommended. When XCE 3104XL is stored at low temperatures, it must be allowed to return to room temperature before use. This normally takes 30 minutes.

Health and Safety:

XCE 3104XL, like many industrial compounds, possesses the ability to cause severe skin and eye irritation upon contact. Certain individuals may also develop an allergic reaction after exposure (skin contact, skin absorption, inhalation of vapors,

etc.) which may manifest itself in a number of ways including skin rashes, itching sensations and breathing difficulties. Components of this product may be absorbed through the skin. Handling this product at elevated temperatures may also generate vapors irritating to the respiratory system.

Good industrial hygiene and safety practices must be followed when handling this product. Proper eye protection and appropriate chemical resistant clothing should be worn to minimize direct contact and prevent possible skin absorption. Consult the Material Safety Data Sheet (MSDS) for detailed recommendations on the use of engineering controls and personal protective equipment.

This information is only a brief summary of the available safety and health data. Thoroughly review the MSDS for more complete information before using this product.

Attention Specification Writers:

The technical information contained herein is consistent with the properties of this material but should not be used in the preparation of specifications as it is intended for reference only.

Medical Implantable Disclaimer

"In the event this product is intended by you for use in implantation in the human body, you are hereby advised that National Starch (or Emerson & Cuming) has not performed clinical testing of these materials for implantation in the human body nor has National Starch (Emerson & Cuming) sought, nor received, approval from the FDA for the use of these material in implantation in the human body. It is YOUR responsibility, as a manufacturer of any such device, to ensure that all materials and processes relating to the manufacture of any medical device fully comply with all applicable federal, state and local laws, rules, regulations and requirements as well as any such laws, rules, regulations, directives or other orders of any foreign country where such product is sold. If you have not undertaken the necessary investigations to ensure compliance you are advised NOT TO USE this product in the manufacture of any device which is to be implanted in the human body. No representative of ours has any authority to change the foregoing provisions."

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