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TECHNICAL DATASHEET

Durashield™ V42 Mono Filler

HEAVY COPPER DIELECTRIC

PRODUCT DESCRIPTION

Durashield V42 Mono Filler is a UV-sensitive, single component product designed as a trench-filler for thick copper printed circuit boards. The formulation is acrylate-based and 100%-curable.

Durashield V42 Mono Filler is characterised by exceptional:

- Through-cure
- Flexibility
- Adhesion to copper, epoxy and resin-interlayer substrates.
- Thermal shock & solder resistance in lead-free, high temperature application

Durashield V42 Mono Filler is compatible with lead-free soldering processes, in combination with a soldermask topcoat such as **Durashield V42 Mask** (see separate technical datasheet).

RECOMMENDED PROCESS SEQUENCE

1. Durashield V42 Mono Filler application
2. UV cure
3. Panel cooling
4. Planarisation (panel abrasion)
5. Cleaning & cooling
6. Soldermask surface preparation
7. Durashield V42 Mask application
8. Joint Filler & Mask thermal cure

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PRODUCT PREPARATION

Durashield V42 Mono Filler is designed to be used in the temperature range 20-30°C as supplied, without viscosity adjustment

Slight phase separation may occur on storage. Ensure that any thicker material at the base of the container is brought into the bulk of the product, and then apply low shear mixing to obtain uniform composition. High shear mixing will cause air entrainment and should not be used.

After mixing, allow the mixed ink to stand for at least 15 minutes before application.

Yellow safe light illumination should be employed prior to application.

Product exposure to temperatures between 20-30°C should be restricted to a maximum of 7 days. See 'Storage & Shelf-life' section below for product storage recommendations.

BOARD PREPARATION

Panels should be clean, dry and free from residues and surface oxides prior to V42 Mono Filler application.

Copper surfaces may be chemically cleaned, abrasive wet brushed or pumice scrubbed. Panels should be water rinsed and fully hot air dried immediately after treatment.

APPLICATION

Automatic Processing

For high volume-high productivity thick copper filling, Electra recommends the Rohm and Haas DF1122 Coater equipment. Excellent results are also achieved using conventional screen-printers or the DEK Proflow head although these systems may need some modifications in order to achieve optimum results.

Manual or Semi-Automatic Processing

V42 Mono Filler may be manually dispensed or automatically pumped, either directly onto the panel or via a coarse screen mesh.

The product is then spread, typically by a stiff or semi-rigid wiper blade. Several passes may be necessary to achieve complete filling of all cavities. Use of a blanking template will reduce ink consumption.

Whatever application technique is employed, over-filling should be avoided for the following reasons:

- non-productive ink usage
- the need to remove excess material during the abrasion stage
- the possibility of insufficient UV cure (see below)
- increased possibility of bubble entrapment



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UV CURING

Recommended UV exposure energy for V42 Mono Filler is 3.5 – 4.5 J/cm² for 200-400µm layers, when using medium-pressure mercury or iron-doped mercury lamps in good condition, with dominant emission lines in the region 340 - 380nm.

Reduced exposure should be considered for thinner layers where through-cure is more readily achieved. Conversely, copper circuitry greater than 400um thick, or excessively filled 400um trenches, may require greater UV energy.

Reducing relative exposure yields slightly softer, more flexible layers; increasing relative exposure creates harder layers.

Extremes of exposure can adversely affect adhesion and integrity of V42 Mono Filler layers and should only be used after due experimentation.

ABRASION

Following UV curing, excess V42 Mono Filler is normally removed prior to soldermask application. This may be achieved by a variety of abrasion equipment and processes, such as industrial belt- or rotary-sanders and brushes. Dry abrasive is typically 80 – 120grit. Note that damage to copper structures may result from the use of very coarse abrasives.

Under optimum conditions, excess V42 Mono Filler can be removed in seconds without damaging the intended material in the trenches.

Points of concern are excessive abrasion pressure and clogging of the abrading medium. Both may lead to localized over-heating which may cause the V42 Mono Filler to soften and lose adhesion, particularly in an in-line process immediately after UV curing. Temperatures greater than 65°C should generally be avoided until the material is fully cured.

On completion of the abrasion process, it is recommended that the panel is cleaned by pressure rinsing or wet-brushing, in order to remove loosely adhering copper particles and V42 Mono Filler dust. Copper panels normally require surface preparation immediately prior to soldermask application.

METALLISATION

Fully cured Durashield V42 Mono Filler surfaces may be metallised after plasma de-smearing.

CLEANING

Equipment should be cleaned of residual soldermask using **SW100** or **Dowanol PMA**.

STORAGE & SHELF-LIFE

Durashield V42 Mono Filler should be stored in a cool, dry area (5-15°C recommended) in its original container. Under these conditions, shelf life is at least 6 months.

Storage of the product above 30°C may cause polymerisation and should be avoided.

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The product is designed to have exceptional sensitivity to UV radiation. Unintentional exposure to any source of UV or white light, and especially to direct sunlight, should be avoided. Store in the original packaging or alternative UV-opaque containers.

PRODUCT PROPERTIES

| <u>Parameter</u> | <u>Value ⁽¹⁾</u> | <u>Test Method</u> |
|--|--|---|
| Dielectric Strength | 57 kV/mm | IPC SM-840C, paragraph 3.8.1 / IPC TM-650 method 2.5.6.1 |
| Coefficient of linear thermal expansion | $210 \times 10^{-6} /^{\circ}\text{C}$ | TMA, measured over the range 75-120°C |
| Flammability Rating: ≤ 75um coating on 1.5mm FR-4 laminate | 94V-0 | In-house testing ⁽²⁾ |
| Surface Resistivity | 7×10^{13} Ohm | ASTM D 257 |
| Volume Resistivity | 4×10^{14} Ohm-cm | ASTM D 257 |
| Solder resistance - | > 10sec at 275°C > 20 sec at 260°C | Electra in-house testing ⁽³⁾ |
| Viscosity (as supplied), | 16,000 +/- 1,500 | Brookfield, spindle #29, 20rpm mPa.s at 25°C |
| Shelf Life | 6 months minimum | Storage in original containers, in range 5 – 15°C |

⁽¹⁾ Stated values are for guidance only and should not be considered specifications.

⁽²⁾ According to Section 8.0 of UL94 "Test for Flammability of Plastic Materials for Parts in Devices and Appliances"

⁽³⁾ UV- and thermally cured 32T screen-printed coatings on copper solder-floated, evaluated for evidence of blistering or lifting



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For further information, contact:

Electra
Roughway Mill
Dunk's Green
Tonbridge
Kent TN11 9SG
ENGLAND

Tel: +44 (0)1732 811 118
info@electrapolymers.com

Or visit our Website for details of local offices and Distributors

www.electrapolymers.com

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