



DJ MICROLAMINATES, Inc  
Dry Film Sheets

## SUEX® Thin Dry Film Sheets (TDFS) Product Data Sheet – Rev 6/2020

**SUEX® TDFS** are photo imageable epoxy sheets for plating, wafer level packaging and MEMS applications. The sheets consist of a catatonically cured modified epoxy photoresist between two throw-away layers of protective polyester film (PET). The epoxy photoresist formulation contains an antimony-free photoacid generator and is prepared under a highly controlled solvent-less process, which provides uniform coatings. The solvent developed negative working photoresist is sensitive to UV radiation in the range of 350 – 395nm.

SUEX is compatible with and exhibits good adhesion to silicon, silicon nitride, copper, gold, aluminum, glass, polymers, other metals and oxides.

### **PRODUCT AVAILABILITY**

Sheets are available in thicknesses from 20µm to 75µm and are pre-cut into standard wafer and panel sizes for lamination to a flat substrate. They are extremely easy to use and ready for lithographic processing in minutes.

**Standard Thicknesses:** 20, 25, 30, 50 and 75µm

#### **Precut Sheets:**

Round/wafer cut or square: 46/48, 72/73, 96/98 mm.  
Square, rectangular or custom from 25mm to 298mm sq.

### **PROCESSING**

**SUBSTRATE PREPARATION:** Substrates should be free of organic contamination and metal oxides prior to lamination. Cleaning and drying is recommended immediately prior to lamination. Dehydration bake but may require further cleaning and surface activation prior to lamination. For copper, glass, gold, etc. see special treatment recommendations. Adhesion promoters are typically not useful.

**LAMINATION:** Remove the clear PET cover sheet immediately prior to lamination. Laminate on a hot roll laminator. Do not allow sheets to contact substrate until immediately (<1cm) before rollers. Vacuum laminate over topography for thick films.

#### **Recommended conditions for hot roll lamination:**

Temperature: 60 - 70°C for all rolls and plates  
Pressure: 5 – 10 psi (30 – 65 kPa)  
Speed: 0.5 – 1.5ft/min (0.15 – 0.5m/min),  
thicker films may require slightly  
slower speed.

**BAKE:** A post lamination bake is normally not needed or recommended. For improved adhesion and surface quality, the laminated article may be baked on a hotplate at 80 - 85°C for 5 minutes.

**PET REMOVAL:** After the PLB bake the remaining PET film should be left on the laminate as the substrate cools to room temperature to protect the resist surface until use. Remove just prior to exposure.

**EXPOSURE:** For optimum resolution i-line filters or soda lime masks are highly recommended to remove wavelengths below 350nm for improved resolution and sidewall acuity. The dose will vary depending on resist thickness, substrate, process and other requirements. see Table 1 for estimated doses on silicon. Mask sticking: Use anti-stick coating on the mask.

**POST EXPOSURE BAKE (PEB):** The PET coversheet must be removed prior to PEB. We recommend a 85°C oven bake for 30-60 minutes for lower stress or a 95°C bake for 5–10 minutes for speed. Cool slowly over-3-5 hrs. for least cracks/best adhesion.

**DEVELOPMENT:** Develop at room temperature using a two bath PGMEA (propylene glycol methyl ether acetate) system, face down with mild agitation. Develop times for best resolution are shown in Table 1.

**RINSE/DRY:** Wash the developed wafer in isopropyl alcohol, then immerse in clean IPA for 1 to 5 minutes.

**HARD BAKE (Optional):** If required, bake at 125°C/60 min, 150°C/30 min or 150°C/15-20 min. A 200°C hard bake for 30 – 60 minutes is required to remove all volatile components from the film.

**REMOVAL:** SUEX is generally used as a permanent highly cross-linked film and is not intended to be removed. For films that have not been hard baked, an NMP based remover may lift the film from the substrate. Hard baked films are generally removed using CO<sub>2</sub> laser ablation equipment.

**PLATING:** SUEX is compatible with acid copper, tin/lead, tin, nickel sulfonate, most lead-free electrolytes, and acid gold plating baths. Plasma cleaning is recommended to remove contamination and prepare the surfaces for electroplating.

**STORAGE:** SUEX sheets should be stored in the original black packaging in a standard, temperature-controlled environment between 18°C (65°F) to 25°C (77°F). When stored under these conditions, the shelf life is up to 2 years from date of manufacture.

**DISPOSAL:** SUEX is a non-hazardous, non-regulated material. Dispose in accordance with all local, state and federal environmental regulations.

**ENVIRONMENTAL, HEALTH AND SAFETY:**  
Refer to our SUEX Series TDFS Safety Data Sheet.

# SUEX® Epoxy Thin Film Sheets (TDFS)

## SUEX® TDFS Data Sheet

Rev. June 2020

**Table 1: Process conditions for Thin SUEX TDFS on silicon wafers**

Thickness (µm)	20	25	30	40	50	75
% Transmission	92	88	89	88	86	81
UV Filtered Dose, mJ/cm <sup>2</sup> @ 365 nm	720	725	760	790	825	920
No Filter Dose, mJ/cm <sup>2</sup> @ 365 nm	325	320	335	348	370	430
PEB, min/°C	5/85-95°C	5/85-95°C	5/85-95°C	5/85-95°C	5/85-95°C	5/85-95°C
Devl Time Face Down, min	12(10 + 2)	15(10 + 5)	15(10 + 5)	20(15 + 5)	20(15 + 5)	25(20 + 5)

### Properties of CURED SUEX FILM

Property	Values	Measuring Method
T <sub>g</sub> , DMA max tan δ	173°C	DMA
5% wt loss temp/Decomp onset	356 °C/398 °C	TGA
1%/hr decomp temp in N <sub>2</sub>	262 °C	TGA
CTE RT, α <sub>1</sub> /α <sub>2</sub> ppm	50, 63, 190	TMA
Shrinkage X/Y, Z	<1%	CD, FT loss
Residual stress, MPa	6 est*	Wafer Bow
Modulus, GPa	3.9	ASTM D3379-75, Dage tensile pull
Tensile Strength, MPa	86	ASTM D3379-75, Dage tensile pull
Elongation	8%	ASTM D3379-75, Dage tensile pull
Min Bend Radius, cured 100µm film	<1 mm	spindle
Adhesion, MPa		
Si	70	Dage 4000 shear
Cu	80	
Al/Cu	54	
Glass (borosilicate)	61	
Quartz	60	
Dielectric Constant	3.7	ASTM D150-98
Dielectric Loss, Tan δ	0.038	ASTM D150-98
Dielectric Strength, KV/mm	100	ASTM D149-97A/JIS C2110
Volume Resistivity, Ωcm	8.1X10 <sup>15</sup>	ASTM D257-07
Surface Resistivity, Ωcm	2.2X10 <sup>16</sup>	ASTM D257-07
Moisture Uptake, 24hr RT soak	1.5%	ASTM D570-98

**Notice:** All statements, recommendations and information contained herein are based on test results that DJ MicroLaminates, Inc. believes to be accurate and reliable. The user shall determine the suitability of this material for his or her intended purpose and application. No warranties, whether expressed or implied for fitness for a particular purpose, shall apply to this material.

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