LAMINAR® UDF2000 series DRY FILM PHOTORESIST

DESCRIPTION

LAMINAR® UDF2000 SERIES DRY FILM PHOTORESIST is a negative working aqueous resist specifically designed for both conventional exposure & UV laser direct imaging (365nm and 405nm) applications. **LAMINAR® UDF2000 SERIES** has been designed for tenting, plating and acid etching applications in the production for ***high density circuit boards***.

SPECIFICATION

Film Type	UDF2040	UDF2030
Thickness(μm)	38 ± 2	29 ± 2
Color(unexposed)	Green	Green
(exposed)	Blue	Blue
Recommended uses	Plating Tent and etch Print-and-Etch	Tent and etch Print-and-Etch

FEATURES

- Good adhesion to the substrate.
- Fast photo-speed.
- High resolution capability.
- Straight sidewalls.
- Clean developing characteristics.
- Excellent tenting & plating behavior characteristic
- High chemical resistance to acidic etchants.

PROCESSING

SURFACE PREPARATION

For maximum dry film adhesion, surfaces to be coated must be clean, dry, and free of contaminates prior to lamination. Several cleaning methods work acceptably for the **LAMINAR® UDF2000 series DRY FILM PHOTORESIST** such as jet pumice scrubbers, Scotch Brite, aluminum oxide spray, pumice brushing, and chemical cleaning.

Lamination

LAMINAR® UDF2000 series DRY FILM PHOTORESIST can be applied with all types of commercially available laminators. The automatic cut sheet laminator is preferred, because it eliminates trim waste and provides an exposed copper border around all four sides of the panels.

Recommended lamination parameters depend on the surface profile of the copper and imaging requirements. For examples, preheating, slow laminating speed and higher pressure may be needed for fine line applications. Although specific lamination parameters should be established based on experience for each application, the recommendations in Table 1 provide general guidelines.

Table 1.

Recommended parameters

MANUAL LAMINATOR	
Roll temperature	**90～120°C (194～248°F)**
Roll speed	**1.0～3.0m/min (3～10feet/min)**
Air assist pressure	**35～50psi**
Exit temperature	**40～65°C (105～149°F)**
AUTOMATIC CUT- SHEET LAMINATOR	
Roll temperature	**90～130°C (194～266°F)**
Roll speed	**1.0～3.0m/min (3～10feet/min)**
Air assist pressure	**35～50psi**
Exit temperature	**40～65°C (105～149°F)**
Seal temperature	**60～80°C (140～176°F)**
Seal pressure	**3.0～5.0 kg/cm^2**
Seal time	**1～4 sec**

Cleanliness

The panels and the lamination rolls must be clean to prevent pinholes caused by dirt, copper and epoxy-glass slivers and resists chips.

Handling and Hold Times

After lamination, panels should be racked with spaces between each panel. Allow the panels to cool to room temperature prior to exposure. Panels should never be stacked

on top of each other, as this will cause trapped dirt particles to imprint the resist from one board to the next. Stacking also traps heat and interferes with resist performance during exposure or development.

Conformation

In print-and-etch and tent-and-etch applications, surface defects such as pits, dents, scratches and weave dominance will cause defects such as opens, cuts and dishdowns. In pattern plating application, these same surface defects will cause shorts and copper residue. **LAMINAR® UDF2000 series DRY FILM PHOTORESIST** has excellent conformation capabilities to overcome these surface defects and will help improve yields. Of course, conformation also can be improved by:

- preheating the panels
- increasing lamination pressure
- increasing lamination temperature
- slowing lamination speed
- using thicker film

Too much pressure, higher roll temperature and preheating can force dry film into holes thinning the resist at the rim of the hole and resulting in tent breakage. Lamination parameters should be carefully evaluated when the panels have large tent holes.

EXPOSURE:

- **LAMINAR® UDF2000 series DRY FILM PHOTORESIST** has a good response in the 365 nm and 405nm wavelength range on DI/LDI and also conventional exposure system. Processing in yellow light area is required from lamination to development.

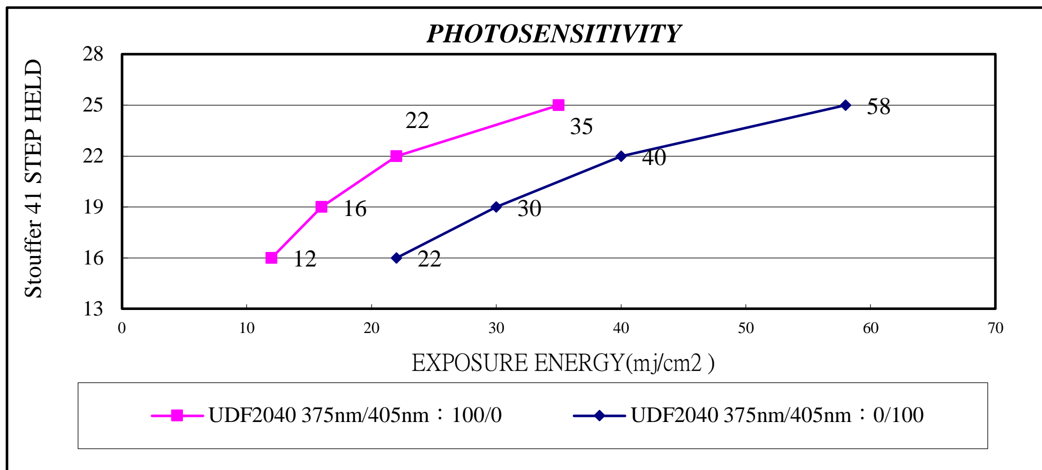
Exposure parameters

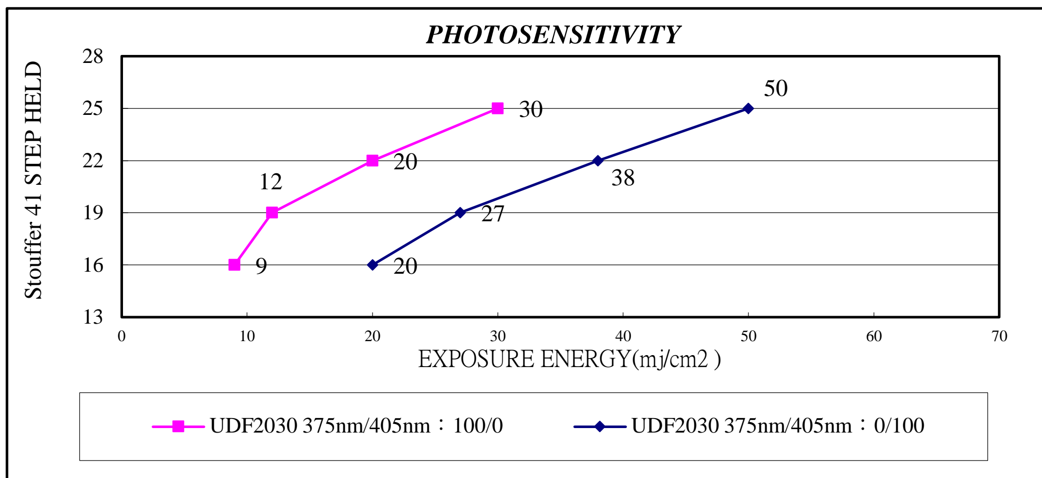
Resist type	**UDF2040**	**UDF2040**	**UDF2040**
Exposure energy set mode	**375nm/405nm：100/0**	**375nm/405nm：0/100**	**Collimated light**
Exposure energy (mj/cm^2) :	**12~35 mj/cm^2**	**22~58 mj/cm^2**	**6~30 mj/cm^2**
Stouffer 21 step tablet: resist	**6 - 9**	**6 - 9**	**5 - 8**
Copper	**7 – 10**	**7 – 10**	**6 – 9**
Stouffer 41 step tablet : resist	**16 – 25**	**16 – 25**	**13 – 22**
Copper	**17 – 26**	**17– 26**	**14– 23**

Resist type	UDF2030	UDF2030	UDF2030
Exposure energy set mode	375nm/405nm：100/0	375nm/405nm：0/100	Collimated light
Exposure energy (mj/cm^2) :	9~30 mj/cm^2	20~50 mj/cm^2	6~28 mj/cm^2
Stouffer 21 step tablet: resist	6 - 9	6 - 9	5 - 8
Copper	7 – 10	7 – 10	6 – 9
Stouffer 41 step tablet : resist	16 – 25	16 – 25	13 – 22
Copper	17 – 26	17 – 26	14– 23

- A minimum 10 – 15 minutes hold time after exposure prior to development.

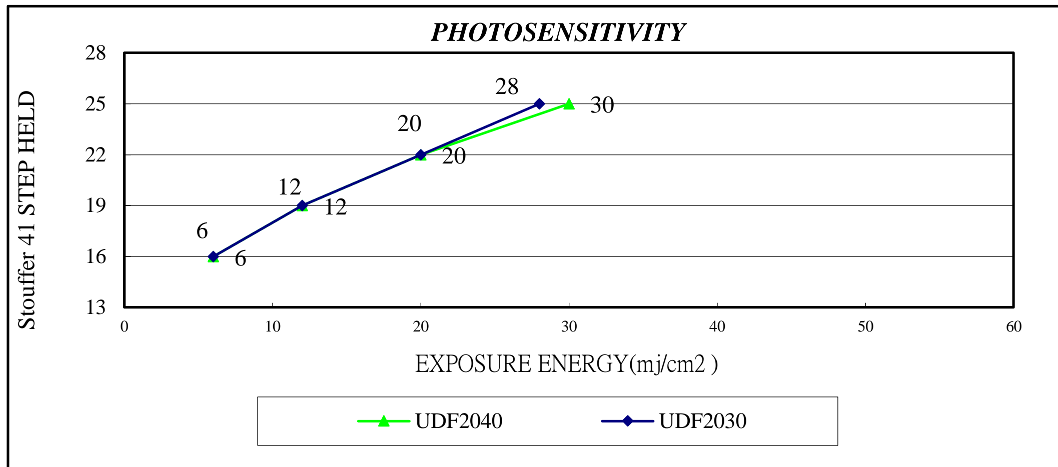
Figure 1. Photosensitivity





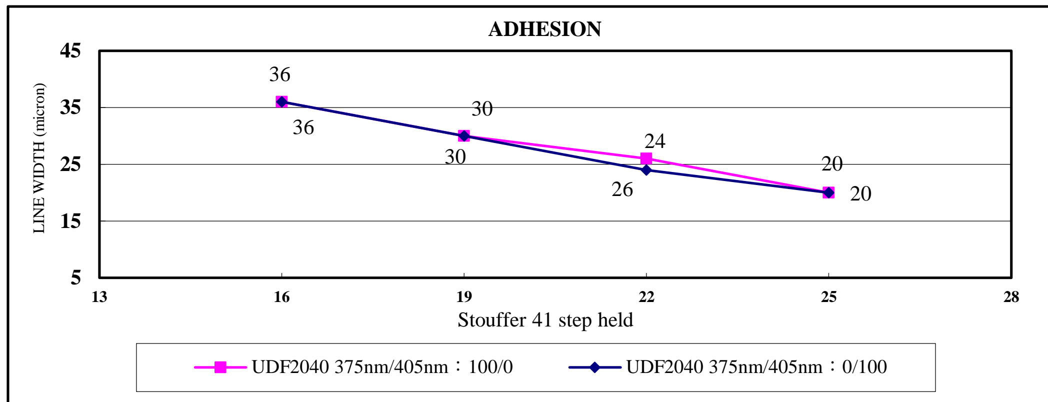
Printer：Nuvogo800

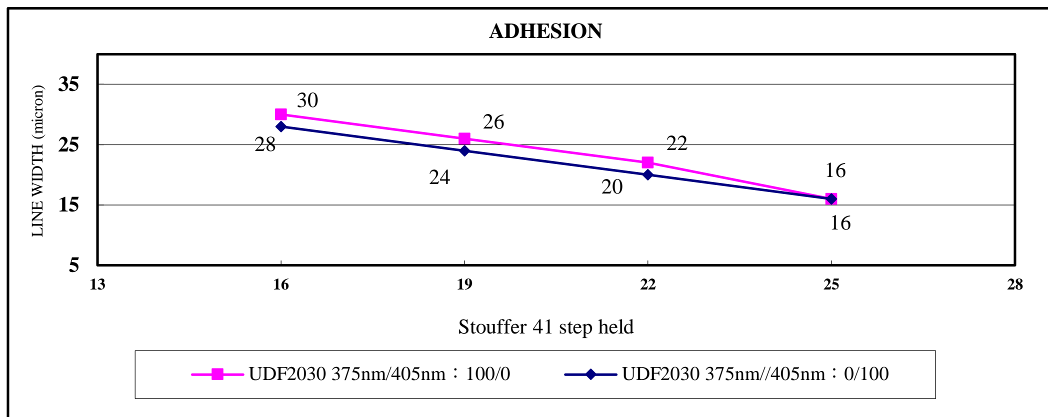
Figure 2. Photosensitivity



Printer：ORC EXM-1201F 5KW

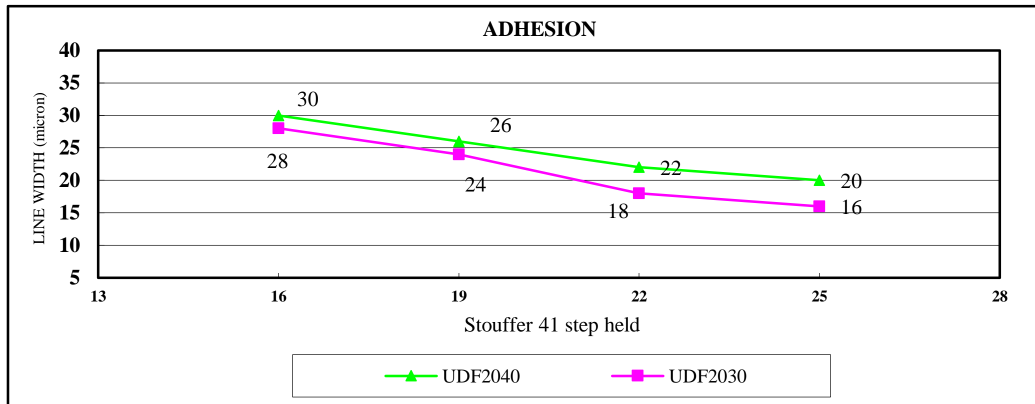
Figure 3. Fine line adhesion





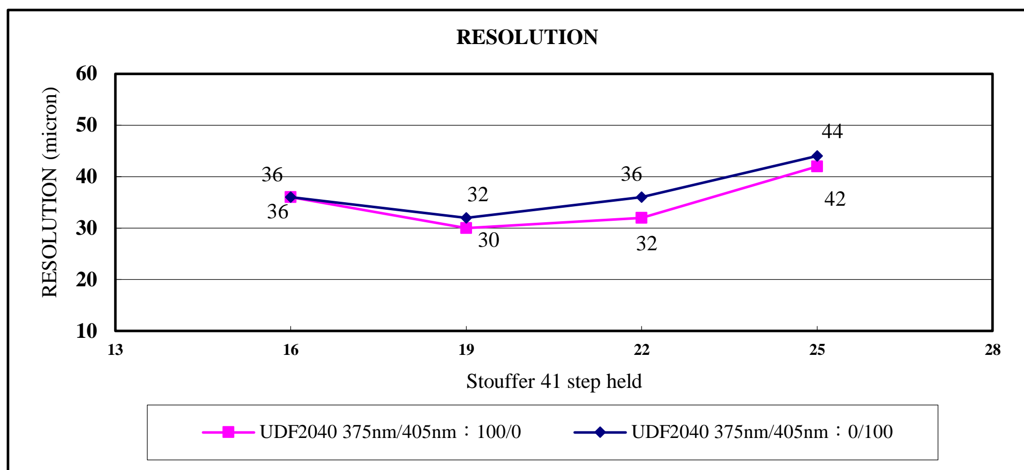
***Lines/Spaces = X/400 μm Printer：Nuvogo800**

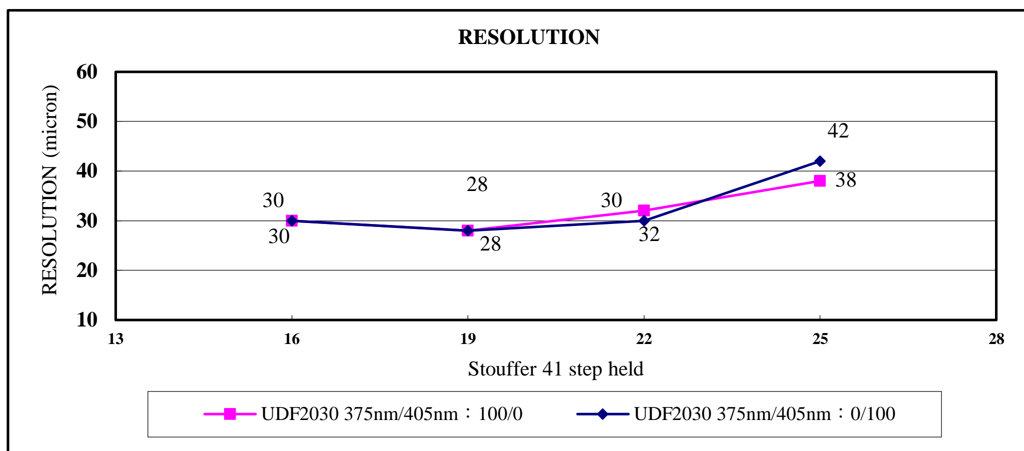
Figure 4. Fine line adhesion



***Lines/Spaces = X/400 μm　Printer： ORC EXM-1201F 5KW**

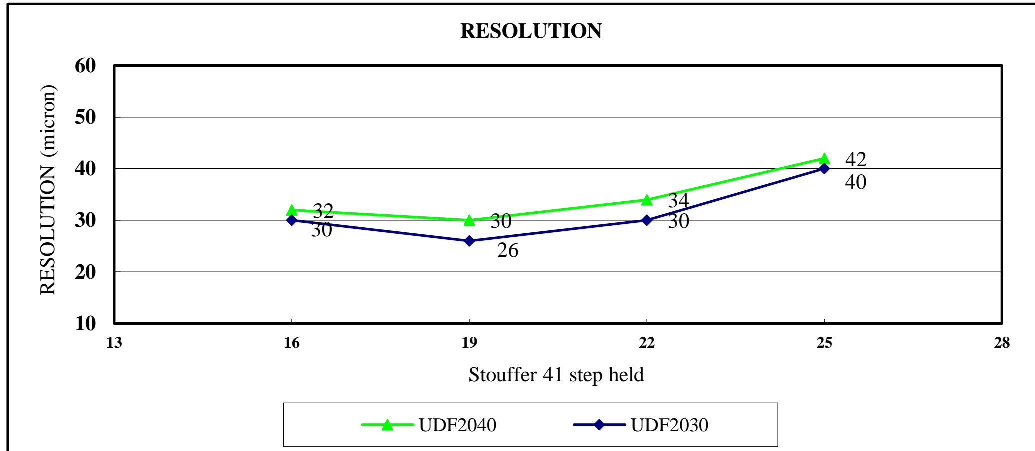
Figure 5. Resolution





***Lines/Spaces = X/X　　Printer：Nuvogo800**

Figure 6. Resolution



***Lines/Spaces = X/X   Printer： ORC EXM-1201F 5KW**

DEVELOPMENT

LAMINAR® UDF2000 dry film can be developed in carbonated based solution.

Developing operation conditions

	optimum	range
Developer solution: Sodium Carbonate Potassium Carbonate	 0.85% 1.0%	 0.7～1.0% 0.8～1.2%
Temperature	28～30°C (82～86°F)	25～34°C (77～93° F)
Breakpoint	55%	50～70% of the chamber length
Pressure Nozzles	1.5～1.7 kg/cm² high impact direct fan or cone	1.5～2.0 kg/cm² (22～30 psi)
Rinse water	hard water (150 – 300 ppm $CaCO_3$ equivalent)	
Rinse spray pressure	2.0 kg/cm²	1.2～2.5 kg/cm²
Rinse temperature	20～25 ℃	15～30 ℃
Drying	hot air blow preferred	
Developing time	UDF2040: 50～60 seconds (28° C) UDF2030: 40～50 seconds (28° C)	

Resist Loading:

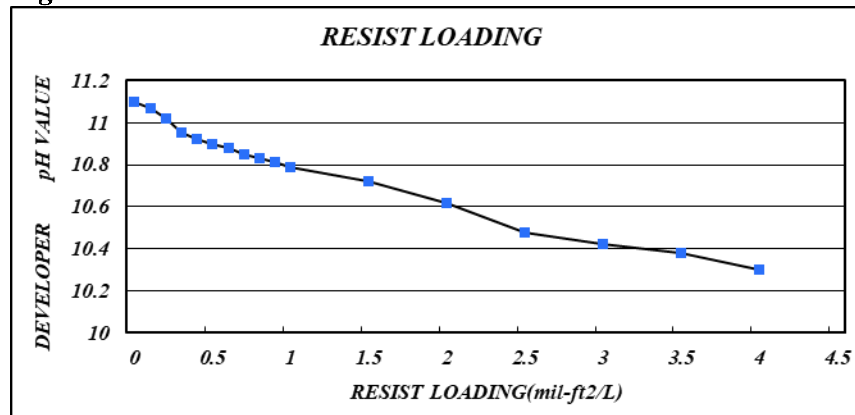
Figure 5. Shows the effect of resist loading on the fall off in the pH of the developer solution. The breakpoint will increase as the resist loading increase in the developer solution. This will cause incomplete developing resulting in resist scum and bad resolution.

In a batch solution, the resist loading is 3.2 ~ 4.0 mil·ft^2/ L (12 ~ 14 mil·ft^2/ gal). Developer solution should be replaced as resist loading up to this high level. Use flowing guidelines to change solution.

- pH falls to 10.3.
- Developing time becomes 30% longer than that for fresh solution.

In a feed-and-bleed system, the resist loading is held constant by feeding fresh developer to developer sump. The recommended loading limit in automatic replenishment system is 1 ~ 2 mil·ft^2/ L. And the pH value of the developer solution will be controlled at the range of 10.8 to 10.6.

Figure 10.



Antifoam

If it is required, suitable antifoam can be added at a ratio of 0.1 – 0.5 ml per liter.

Maintenance

The developer chambers should be cleaned periodically. Resist residue can be removed by 3 – 5% NaOH solutions. Scale can be cleaned with dilute acid.

PLATING

LAMINAR® UDF2000 series dry film photoresist has excellent chemical resistance and performs well in acidic electroplating baths including copper sulfate, tin/lead, bright acid tin.

ETCHING

LAMINAR® UDF2000 series dry film photoresist can be performed well in acid etchants.

STRIPPING

LAMINAR® UDF2000 series dry film photoresist can be stripped in conventional immersion or conveyorized process. Stripper can be 2.0% ~ 5.0% caustic solutions (sodium hydroxide or potassium hydroxide) or proprietary stripping solutions.

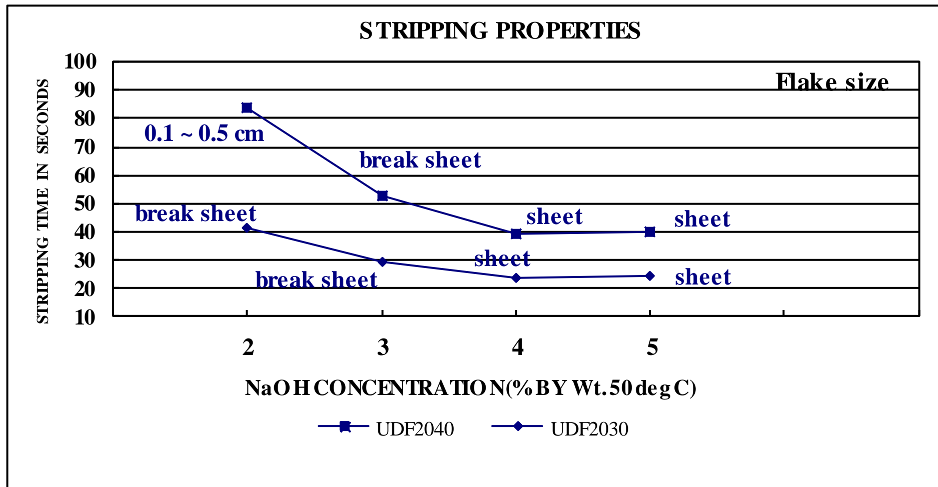
Stripping parameters

Type	**UDF2040**	**UDF2030**
21 step tablet: resist **copper**	**8** **9**	**7** **8**
Time	**39~84 sec**	**24~41 sec**
Temperature	**40～60⁰ C (104～140⁰F)**	**40～60⁰ C (104～140⁰F)**
Pressure	**1.0～3.0 kg/cm² (15～45 psi)**	**1.0～3.0 kg/cm² (15～45 psi)**
Concentration	**2～5% NaOH solution**	**2～5% NaOH solution**

Actual stripping times are influenced by:

- Concentrations of caustic solution
- Stripping temperature
- The height of plating overhang
- Spray pressure
- Exposure level
- Hold time prior to stripping

Fig 11. Stripping time



Safety and Handling:

1. Avoid skin contact with unexposed resist and wash thoroughly with soap and water if contact is made.
2. Dry film lamination may cause vapors to be generated. A well-ventilated room is necessary.
3. Open resist only in a controlled yellow light area.
4. Do not reuse the dry film release sheets or cover sheets.
5. Read MSDS prior to using and handling LAMINAR® UDF2000 SERIES series dry film photoresist.

Storage:

Store in a cool, dry location 5℃ to 20℃ (41°F to 68°F) and 50 % relative humidity ±10% to assure maximum shelf life and product performance.

Warranty

The information contained herein is correct to the best of our knowledge. The recommendations or suggestions contained in this bulletin are made without guarantee or representation as to results. We suggest that you evaluate these recommendations and suggestions in your laboratory prior to use. Our responsibility for claims arising form defects in material or workmanship or any other breach of warranty, negligence or otherwise is limited to the purchase price of the material.