ROHM AND HAAS ELECTRONIC MATERIALS

TINPOSIT™ LT-26 IMMERSION TIN

For PWB Metallization Applications

Regional Product Availability			
N. America	Japan/Korea	Asia	Europe
✔			

DESCRIPTION

Tin is deposited onto copper, copper-based alloys and tin/lead electroplate by simple immersion in the Tinposit LT-26 Immersion Tin plating bath. The deposits bond chemically to the base metal, and affords corrosion protection. There are a number of choices of bath make-ups and operating processes to meet various requirements.

USES

Tinposit LT-26 Immersion Tin affords exceptional corrosion protection to copper and tin-lead electroplate, and greatly facilitates soldering. Even "unsolderable" tin or tin-lead plate is cleaned and tinned by immersion in Tinposit LT-26 Immersion Tin. Since the bath is an immersion plating solution, it is excellent for barrel plating and for tinning complex-shaped parts.

PROCESS RECOMMENDATIONS

Pre-cleaning

For best results, parts must be free of oil, grease and other organic soil. For badly soiled parts:

1. Scour with Scrub Cleaner™ 28 cleaner, rinse and dry.
2. Degrease.
3. Soak in hot Neutra-clean™ 7 cleaner and rinse.

Do not precede or follow Tinposit LT-26 Immersion Tin with an alkaline treatment. Household cleaners should not be used nor should parts be scrubbed with steel or aluminum media.

Standard Process

This is effective when basis metal has been precleaned or is not badly soiled. Copper should be dry upon entering the Tinposit LT-26 Immersion Tin bath; if this is not feasible, then use the "Wet" process.

"Wet" Process

A pretreatment in Neutra-clean 7 cleaner prevents formation of uneven or streaky deposits of tin when copper is wet when entering Tinposit LT-26 Immersion Tin. This cleaner also removes fingerprints, stains and oxides. If cleaning action is not needed, the cleaner bath may be used at room temperature.

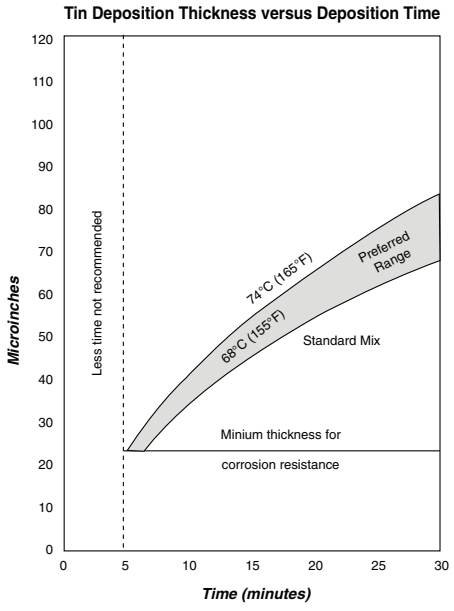
"Mirror Tin" Process

Highly-reflective deposits can be obtained on copper and brass by treating the metal with Chem-polish™ 14-1 Bright Dip. After prolonged rinsing, follow with the "Wet" Process. Use the Tinposit LT-26 Immersion Tin "Bright Tin" mix.

BATH OPERATION

Deposition Time

The required deposition time depends on tin thickness desired and on bath make-up. As the graph below illustrates, tin deposition is rapid in the first 10 minutes, then it continues at a moderate rate. The thickness values for tin on copper are from new baths; plating thicknesses lessen as tin content is depleted. While deposition rate is quick on brass, the final thickness is less. Tinposit LT-26 Immersion Tin deposits are so dense that a thickness of 50 millionths of an inch resists chromic acid for 120 minutes. When using a fresh Tinposit LT-26 Immersion Tin bath, at least a 5 minute treatment is needed for corrosion protection and extended shelf life.



CB06N009, Rev. 2
February 2009

TINPOSIT LT-26 IMMERSION TIN

Agitate

Agitate work to prevent uneven deposition thickness which can be caused by localized "tin starvation" or cold-spots. Use mechanical agitation; do not use air agitation. Barrel plating is recommended for small parts.

Rinsing

Good rinsing is needed after treatment in Tinposit LT-26 Immersion Tin. For best results, all rinses should be continuous forced overflow. Hot water is preferred, although prolonged cold water rinsing can also be used for metal parts.

Tinning of Etched Circuits

Use a hot water rinse after the Tinposit LT-26 Immersion Tin bath. Operate baths at 155–165°F for 5 minutes.

IMPORTANT: Do not enter the Tinposit LT-26 Immersion Tin bath just after vapor degreasing; bake in between to drive off residual solvent.

Cloud Point

If the solution cloud point is reached [approximately 77°C (170°F)], allow bath to cool to normal operating temperature.

BATH MAKE-UP

The standard mix and "bright tin" mix are preferred for most uses. Deposits from "bright tin" mix are finer grained, more reflective, and slightly more corrosion resistant. "Fast tin" mixes are designed to provide thicker tin deposits.

1. Add the concentrated hydrochloric acid to distilled water. Use C.P. or reagent-grade, hydrochloric acid; do not use muriatic acid.
2. Heat to at least 82°C (180°F).
3. While stirring, slowly, add Tinposit LT-26 Immersion Tin salts in accordance with the following schedule.

Replenishment Schedule

	Bath Volume	Water	HCl	LT-26 Salts
Standard Mix	1 liter (10 gal.)	850 ml (8.5 gal.)	50 ml (2 qu.)	150g (12.5 lbs.)
"Bright Tin" Mix	1 liter (10 gal.)	825 ml (8.25 gal.)	75 ml (3 qu.)	150g (12.5 lbs.)
"Fast Tin" Mix	Add 2 or 3 times more Tinposit LT-26 Immersion Tin salts than used for "bright tin" operate at 80–93°C (175–200°F)			

BATH MAINTENANCE

Tinposit LT-26 Immersion Tin solutions are very stable. The white precipitate that forms on cooling readily redissolves on reheating. The bath will range from nearly colorless to pale-yellow, depending on age and concentration. For best operating results it is necessary to:

1. Maintain volume level within 90% of the original volume level by adding deionized water.
2. Maintain pH between 0.5 and 0.75 for standard and fast mixes and between 0.4 and 0.5 for bright tin mixes. using reagent grade reagent hydrochloric acid.
3. Maintain tin concentration, or discard the bath when tin content becomes too low.

For complete information on bath controls and maintenance refer to the Tinposit LT-26 Immersion Tin Analytical Procedures.

Too much acid (pH below 0.4) or excessive iron contamination will cause black spots to occur in the tin deposits, which will adversely affect corrosion resistance. Exercise care to prevent the possibility of iron contamination from racks, nearby equipment, or ferric-chloride-based etchants.

YIELD

One liter of Tinposit LT-26 Immersion Tin standard mix will cover at least 0.98 m^2/ liter (40 ft^2/gal.) of copper with a tin thickness of 30 microinches.

ANALYTICAL PROCEDURES

Quick Maintenance Checks

I. Scope

To provide quick and simple control methods for checking the "standard" bath make-up.

a) To control pH within operating limits.

b) To control Tinposit LT-26 Immersion Tin salt concentration within operating limits.

II. Apparatus

a) "Precision" Control Paper No. 11 (available from Precision Laboratories, 1883 Reading Road, Cincinnati, Ohio 45215).

b) Pyrex beaker

c) Thermometer

TINPOSIT LT-26 IMMERSION TIN

III. Procedure for Controlling pH

a) Bring the solution up to the original volume by adding water.

b) Stir well.

c) Determine the pH of the bath by immersing a strip of the pH paper in the bath at operating temperature. Follow directions printed on the box and in the glass vial.

d) The pH of the "standard" and "fast mixes" should be within the operating range of 0.5 and 0.75, while the pH range for the "bright tin mix" is 0.4 to 0.5. If the pH is above the specified range for the corresponding mix, add 50 ml reagent-grade hydrochloric acid per gallon of bath volume. This addition should adjust the pH within operating limits.

e) Check the pH of the adjusted solution to make sure the pH is within the recommended range. If the pH is still above the pH range specified, add a second increment of 50 ml reagent-grade hydrochloric acid per gallon of bath volume.

IV. Procedure for Checking Tinposit LT-26 Immersion Tin Salt Concentration

As the tin concentration drops from use of the Immersion Tin bath, the temperature at which crystallization of the solution takes place also drops.

Test Procedure

a) Bring the solution up to the original volume by adding water.

b) Stir well.

c) Using a suitable size Pyrex™ beaker, take off a sample of the Immersion Tin bath.

d) Place a thermometer in the sample solution.

e) Stir gently until white crystals form in a noticeable quantity throughout the solution; then take the temperature reading.

A fresh bath will crystallize at 57–60°C (135–140°F). When the crystallization temperature drops to 46–49°C (115–120°F), the plating rate will decrease by approximately 20% [based on bath operating at 71°C (160°F)]. If the crystallization temperature is allowed to drop to 38°C (100°F), the corrosion resistance properties of the tin deposit will be reduced, even if the length of deposition time is increased. Therefore, when the crystallization takes place at 46–49°C (115–120°F), take the following action:

a) Discard the solution and replace with a fresh Tinposit LT-26 Immersion Tin bath; or

b) Replenish the solution with 1/2 the amount of Tinposit LT-26 Immersion Tin salts as used at make-up. This will restore the original plating rate and will adjust the crystallization point to about 57–60°C (135–140°F).

IMPORTANT: Do not make more than two (2) such additions.

For more detailed information on maintenance and control of Tinposit LT-26, refer to analytical instructions entitled "Maintenance Controls for Tinposit LT-26 Immersion Tin Standard Mix."

MAINTENANCE CONTROLS FOR TINPOSIT LT-26 IMMERSION TIN STANDARD MIX

I. Scope

To provide a system for checking and analyzing the standard Tinposit LT-26 Immersion Tin bath.

a) To check initial make-up and maintenance of:

1. Tinposit LT-26 Immersion Tin salt concentration
2. HCl concentration

b) To control available Sn++ by replenishment

c) To determine useful by total salt concentration

II. Reagents and Apparatus

a) Hydrometer 1.00 to 1.22 range

b) Thermometer

c) 10 ml pipette

d) 50 ml burette

e) 1N NaOH (One Normal Sodium Hydroxide)

f) Phenolphthalein indicator solution

g) 250 ml Erlenmeyer flask

III. Procedure

Check initial make-up

a) Tinposit LT-26 Immersion Tin salt concentration: Check specific gravity with a suitable hydrometer with bath at operating temperature (165°F) and refer to Specific Gravity vs. Concentration graph.

b) HCl concentration: using a prewarmed pipette, pipette quickly a 10 ml sample of the hot bath into a 250 ml Erlenmeyer flask containing approximately 75 ml of water. (If transfer is not done quickly, the sample will solidify in the pipette.) Add 5–10 drops of phenolphthalein indicator and titrate sample with 1N NaOH, to a faintly pink end point. Just before the endpoint is reached, the solution will turn milky, but this does not interfere with the precision of the titration. The volume of 1N NaOH used represents the volume of base necessary to neutralize the Tinposit LT-26 Immersion Tin salts plus the HCl. To obtain the volume of NaOH used to neutralize the Tinposit LT-26 Immersion Tin salt, refer to the Specific Gravity Titration graph. Subtract this volume from the total titration volume to obtain the volume used to neutralize the HCl.

TINPOSIT LT-26 IMMERSION TIN

IV. Calculations

Corrected volume of 1N NaOH in ml × 8.27 = ml/liter of 37% HCl

ml/liter × 0.1282 = fl. oz./gal.

V. Example

A 10 ml sample is titrated and found to take 19.7 ml of 1N NaOH. The specific gravity is 1.08. From the Specific Gravity Titration graph, it is found that 10.03 ml NaOH were used to neutralize the salts. Subtract 10.03 ml from 19.7, giving 9.67 ml of 1N NaOH to neutralize the HCl. The 9.67 is multiplied by the factor 8.27 which gives 80 ml per liter or 80 × 0.1282 = 10.25 fluid ounces per gallon of 37% HCl.

Tinposit LT-26 Immersion Tin solutions should be maintained at 50 ml per liter of 37% HCl to 100 ml per liter of 37% HCl or 6.4 fluid ounces per gallon to 12.82 fluid ounces per gallon. The higher the concentration is maintained, the brighter the finished surface will be.

VI. Maintenance of Available Sn++

As tin is plated out of solution, a proportionate amount of copper is dissolved into solution. If no additional Tinposit LT-26 Immersion Tin salts are added as the tin content is depleted, the specific gravity will remain nearly constant. As the tin concentration drops, however, the temperature at which crystallization of the solution takes place drops in direct proportion to the concentration of the available Sn++. A fresh bath will crystallize at 57–60°C (135–140°F). When the crystallization temperature drops to 46–49°C (115–120°F), the plating rate will drop by approximately 20%. Therefore, when crystallization takes place at 46–49°C (115–120°F), either discard the bath or replenish with 1/2 the original make-up of Tinposit LT-26 Immersion Tin salts. This will restore the original plating rate and restore the crystallization point to 57–60°C (135–140°F).

VII. Procedure

Take a small sample of the bath at operating temperature, taking care that a representative sample is taken (a 250 ml beaker is suitable). Place a thermometer in the solution, and with very gentle agitation, note the point at which crystals start to form. A few isolated crystals may form a few degrees before the rest, so take the reading when the formation of crystals is noticeable throughout the solution.

VIII. Determination of the useful bath life

To determine the amount of replenishment that has been used in a bath, take the specific gravity at 74°C (165°F) and refer to the Specific Gravity Concentration graph. When the concentration of Tinposit LT-26 bath is above 450 grams per liter or the specific gravity above 1.1675, the bath should be discarded.

Note: The previous determinations and checks have been designed so that relatively unskilled personnel can perform them with a minimum of special equipment in as little time as possible. The specific gravity determination is done in the tank in a matter of seconds. The HCl titration requires 10–15 minutes; the crystallization point, 10–15 minutes. For best results, these checks should be performed often enough so that none of theparameters exceed their limits. To start, it should be daily, but experience may indicate fewer checks need to be made.

PROCEDURE FOR 2X CONCENTRATE

Follow Maintenance Control Procedure as previously outlined for standard concentration Tinposit LT-26 Immersion Tin, except replenishment determination (as outlined in section VI. Maintenance of Available Sn++). All other procedures are applicable to the 2x concentrate bath.

DETERMINATION OF TIN METAL IN TINPOSIT LT-26 IMMERSION TIN

I. Method

A chelometric titration using EDTA titrant and Methyl Thymol Blue Indicator.

II. Reagents

a) 0.05M EDTA (18.69) EDTA-Na-2H_2O per liter of solution)

b) Methyl Thymol Blue Indicator* (1.0% weight per volume in deionized water; Make-up fresh weekly)

Acetate Buffer pH 5.0, 60 ml glacial acetic acid and 160 grams sodium acetate anhydrous (or 270 grams sodium acetate trihydrate) per liter of solution

III. Procedure

a) Add 100 ml of deionized water to a 250 ml Erlenmeyer flask.

b) Using a prewarmed pipette (pipette must be prewarmed with hot water to prevent tin salts from precipitating out of solution), transfer 5 ml of bath into the flask. Stir well.

c) Add 25 ml of acetate buffer.

d) Add 5 to 10 drops of Methyl Thymol Blue Indicator solution.

e) Titrate carefully with 0.05M EDTA to clear yellow end point.

IV. Calculations

g/l Sn = ml of EDTA × M of EDTA × 23.74

% Sn = g/l Sn × 7.63

* (3,3'-Bis[N,N di(carboxymethyl)aminomethyl] thymolsulfonephthalein sodium salt

TINPOSIT LT-26 IMMERSION TIN

REPLENISHMENT CHART FOR 10 GALLON TINPOSIT LT-26 IMMERSION TIN BATH

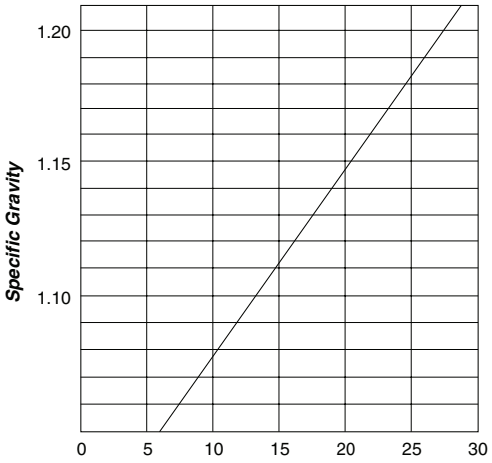
After determining tin concentration of Tinposit LT-26 Immersion Tin bath, replenish according to the following:

Replenishment Schedule

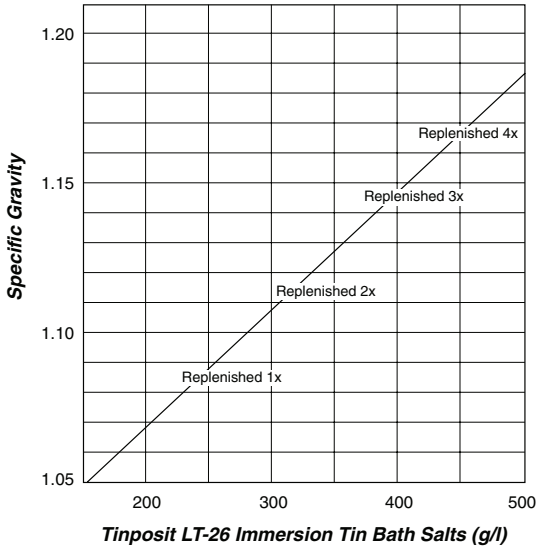
% Sn Concentration	Tinposit LT-26 Immersion Tin Salts (oz./gal.)
100	—
90	20
80	40
70	60
60	80
50	100

Additions must be made slowly when bath is at operating temperature with constant agitation to ensure complete dissolution.

Specific Gravity Tinposit LT-26 Immersion Tin Bath at 74–77°C (165–170°F) vs. Volume of 1.0N NaOH to Neutralize Tinposit LT-26 Immersion Tin Salts in a 10 ml Sample



Specific Gravity Tinposit LT-26 Immersion Tin Bath at 74–77°C (165–170°F) vs. Concentration of Tinposit LT-26 Immersion Tin Salts*



EQUIPMENT

Use containers, fittings, heaters, stirrers and racks made of materials capable of withstanding hot 10% hydrochloric acid. Do not use stainless steel. Pyrex™ glassware laboratory glassware, ceramic, quartz, and some high-temperature plastics (natural color, not dyed) are suitable. Water-jacketed tanks are preferred for temperature control. If immersion heaters or hot plates must be used, provide continuous agitation to prevent hot spots.

PRODUCT DATA

Chemical and physical properties as delivered:

Appearance:	Dry, granular material
Color:	Greyish-white
Flammability:	Non-flammable
pH of 1% Solution:	~2

TINPOSIT LT-26 IMMERSION TIN

HANDLING PRECAUTIONS

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

STORAGE

Store products in tightly closed original containers at temperatures recommended on the product label.

DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Rohm and Haas Electronic Materials Technical Representative for more information.

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