



DEFENSE LOGISTICS AGENCY
LAND AND MARITIME
P.O. BOX 3990
COLUMBUS, OHIO 43218-3990

6 February 2012

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Engineering Practice Study to Determine What Lead Finish JAN
Semiconductor Suppliers are providing on JAN Products.
Project Number 5961-2012-046

The initial draft for this subject document, dated 6 February 2012, is now available for viewing and downloading from the DLA Land and Maritime website:

<http://www.landandmaritime.dla.mil/Programs/MilSpec/DocSearch.aspx>

The study results will be used to help determine whether to add a lead finish designator to the MIL-PRF-19500 part numbering system or evaluate other methods of specifying lead finish.

Concurrence or comments are required at this Center within 45 days from the date of this letter. Late comments will be held for the next coordination of the document. Comments from Military departments must be identified as either "Essential" or "Suggested". Essential comments must be justified with supporting data. Military review activities should forward comments to their custodians of this office, as applicable, in sufficient time to allow for consolidating the department reply. Since Navy-EC is the custodian for this document, all Navy review activities should forward their comments directly to this Center.

The point of contact for this document is Mr. Jason Hochstetler, DLA Land and Maritime-VAC, Post Office Box 3990, Columbus, OH 43216-3990. Mr. Hochstetler can also be reached at 614-692-7106/850-7106, or by facsimile 614-692-6939/850-6939, or by e-mail to: Jason.Hochstetler@dla.mil.

/signed/
Thomas M. Hess
Chief
Active Devices Team

ENGINEERING PRACTICES STUDY

TITLE: SURVEY TO DETERMINE LEAD FINISH JAN SEMICONDUCTOR
SUPPLIERS ARE PROVIDING ON JAN PRODUCTS

6 February 2012

STUDY PROJECT (SEE ATTACHMENT 1)

PRELIMINARY

Study Conducted by DLA LAND AND MARITIME

Prepared by:

Jason Hochstetler

I. OBJECTIVES: DLA Land and Maritime-VAC is conducting a survey on the lead finish of MIL-PRF-19500 Semiconductor packages. The purpose of this survey (in **Attachment 1**), is to obtain input from the military services, manufacturers, and user communities concerning lead finish of all of the case outlines listed in MIL-PRF-19500. The survey results will help determine the implications of adding an additional suffix to legacy part numbers and the effect on NSN listings, parts lists, and benefits. The findings and recommendations provided during the survey process will help determine if a lead finish designator should be added to the requirements of MIL-PRF-19500 or to evaluate other methods of specifying lead finish.

II. BACKGROUND: MIL-PRF-19500 currently does not require the lead finish to be specified in the marking on JAN branded parts, or provide any guidance as an option for including lead finish in the part marking.

Table H-II (**Attachment 2**) was added to MIL-PRF-19500 to provide a guideline of the lead finish options that were standard to MIL-PRF-19500 products. Recently, it was determined that the information in the table was not accurate for all manufacturers, now making it difficult to predict the lead finish associated with each package. In this instance one manufacturer offers gold for all of one quality level while other manufacturers offer gold for only JANS levels and tin lead for JAN/JANTX/JANTXV levels.

III. RESULTS: All comments on this study shall be submitted to jason.hochstetler@dla.mil. Resulting coordinated comments will provide a basis for updating MIL-PRF-19500 with either a lead finish designator, Table H-II update, or an alternate method to specify lead finish. Comments to this study shall be submitted to DLA Land and Maritime within 45 days from the date of this letter.

IV. CONCLUSIONS: The final comments on this study will be published in a final EP study report after all submitted comments have been resolved.

V. RECOMMENDATIONS: DLA Land and Maritime recommends that all military and industry representatives review the lead finish survey and provide comments.

Attachment 1

Survey Questions:

- 1) How many lead finishes does your company offer for MIL-PRF-19500 qualified devices? (please list all that apply)
- 2) How many lead finish types are required for your military programs?
- 3) Do you agree that a lead finish designation should be included in the requirements of MIL-PRF-19500? (currently MIL-PRF-19500 only requires lead finish to conform to the requirements outline in appendix H, included in **Attachment 3**)
 - a. If yes, how would you like to see it incorporated?
 1. Included in the JAN part number.
 2. A separate marking item.
 3. A listing on the QPDSIS similar to the ESD level.
 4. Other _____.
 - b. If the lead finish designation was added to the JAN part number, provide concerns or benefits relating to legacy part numbers and existing parts lists.
- 4) General comments/suggestions for lead finish designation requirements in MIL-PRF-19500.

Attachment 2

This Table H-II is shown with the proposed changes to MIL-PRF-19500P Amendment 1. This change was made to accommodate a manufacturer that makes all of their TO-X quality levels with Au plating.

TABLE H-II. Guideline for standard lead finishes.

SnPb, dipped or plated	Au plated.
Cylinder style with leads through the base: TO-18; TO-5; TO-39; TO-46; TO-72 etc. (JAN, TX, TXV, JANS as applicable)	Cylinder style with leads through the base: TO-18; TO-5; TO-39; TO-46; TO-72 etc. (JANS only)
Rectangular leaded devices: TO-254; TO-257.	Ceramic Surface Mount U; U1; U2; U3; U4; U5; UA; UB.
Heat sink mounted TO packages: TO-3, TO-66; TO-59; TO-63.	14 lead flat pack TO-86, all quality levels
Stud mounted rectifiers: DO-4; DO-5; DO-8; DO-9.	
All axial and MELF SMD's. DO-35; DO-35UR; DO-7; DO-213	
10; 14 and 16 lead ceramic DIPs	

Attachment 3

H.4 PACKAGE FINISH

H.4.1 Package finish. External metallic package elements, including leads and terminals, shall meet the applicable environmental requirements without additional finishing, or shall be finished with a coating which conforms to one of the options listed in H.4.3 and table H-I. Pure tin may not be used to coat any surface nor shall it be used as an undercoat (see H 4.3.f)

H.4.2 Lead and terminal finish. In addition to the requirements of H 4.1, all leads and terminals, except those intended to be attached using threaded fasteners, shall be solderable in accordance with test method 2026 of MIL-STD-750. Combinations of pre-plate electroplate and/or electroless nickel shall not exceed 650 microinches total. See table H-II for a list of standard lead finishes. If the customer requires a specific lead finish it must be specified on the acquisition document.

H.4.3 Detail lead finish requirements.

- a. For all devices mounted by leads or terminals coated by hot solder dipping, the coating shall extend to the seating plane. For devices which are to be connected by wires soldered to lugs or other terminals not used to mount the device, the solder shall cover an area extending .050 inches (1.27 mm) in all directions beyond the designed attachment area.
- b. For leads with solder applied over a surface which is not compliant with table H-I, all non-compliant material shall be covered by solder to the package seal or point of lead emergence, or the lot shall pass test method 1041 of MIL-STD-750 salt atmosphere test with sample size of to 22 pieces, no failures allowed.
- a. All devices-which are solder dipped shall pass screen 14 of table E-IV and table E-V, subgroup 2, appendix E with a sample size of 116 pieces, no failures allowed.
- d. All copper or copper clad leads that are to be plated with gold or silver shall first be coated with a barrier layer to prevent diffusion of the copper through the final lead finish.
- e. Silver leads and silver cladding shall contain a minimum of 99.7 percent pure silver.
- f. Tin based coatings shall be alloyed with a minimum of 3 percent lead which has been shown to inhibit the growth of tin whiskers. Pure tin shall not be used as an undercoat.

TABLE H-I. Coating thickness and composition requirements.

Coating	Thickness microinch/micrometer		Coating composition requirements
	Minimum	Maximum <u>1/</u>	
Hot solder dip (for round leads) <u>2/</u>	60/1.52	NS	The solder bath shall have a nominal composition of Sn60 or Sn63. <u>3/</u>
Hot solder dip (for all shapes other than round leads) <u>2/ 4/</u>	200/5.08	NS	The solder bath shall have a nominal composition of Sn60 or Sn63. <u>3/ 5/</u>
Tin plate (as plated) <u>6/</u>	300/7.62	NS	Shall contain no more than 0.12 percent by weight co-deposited organic material measured as elemental carbon. See H.4.3. f.
Tin-lead plate (as plated) <u>4/ 6/</u>	200/5.08	NS	Shall consist of 3 to 50 percent by weight lead (balance nominally tin) homogeneously co-deposited. Shall contain no more than 0.12 percent by weight co-deposited organic material measured as elemental carbon.
Tin dipping <u>4/</u>	100/2.54		See H.4.3.f.
Gold plate	10/.254	225/5.72	Shall contain a minimum of 99.7 percent gold. Only cobalt shall be used as the hardener.
Silver plate	100/2.54	425/10.8	99.7 percent silver minimum.
Silver cladding	250		
Nickel plate (electroplate) <u>7/ 8/</u>	50/1.27	350/8.89	The introduction of organic addition agents to nickel bath is prohibited. Up to 40 percent by weight cobalt is permitted as a co-deposit.
Nickel plate (electroless) <u>7/ 8/</u>	50/1.27	250/6.35	The introduction of organic addition agents to nickel bath is prohibited.
Nickel cladding <u>9/</u>	50/1.27	350/8.89	

1/ NS = not specified.

2/ See H.4.3.a and H.4.3.b.

3/ The solder Sn concentration in the pot may range from 50 percent Sn to 70 percent Sn.

4/ For threaded stud packages and for terminals not intended for mounting the device only, the minimum coating thickness shall be 100 microinches/2.54 micrometers.

5/ As measured to the center of the flat.

6/ The maximum carbon content (and minimum lead content in tin-lead plate) shall be determined by the manufacturer on at least a quarterly basis. The determination of carbon and lead content may be made by any accepted analytical technique (e.g., for carbon: Pyrolysis, infrared detection (using an IR212, IR244 infrared detector or equivalent); for lead: X-ray fluorescence, as long as the assay reflects the actual content in the total deposited finish.

7/ The maximum specified thickness applies to the final coating, provided all previously deposited nickel layers have been annealed to eliminate the residual deposition stress.

8/ Combinations of pre-plate electroplate or electroless nickel and final electroplate nickel finishing shall not exceed 700 microinches/17.78 micrometers total. Combinations of pre-plate electroplate nickel and final electroless nickel plate finishing shall not exceed 600 microinches total.

9/ Maximum nickel thickness applies only to lead material.