REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

The requirements of DLA Land and Maritime drawing 11006 are applicable.

Prepared in accordance with ASME Y14.100 Detail drawing

REV																		
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PMIC N/A	PREPARED BY David J. Corbett	DLA LAND AND MARITIME COLUMBUS, OHIO 43218–3990
Original date of drawing 05 November 2012	CHECKED BY Joshua Civiello	TITLE PRINTED WIRING BOARD, RIGID FLEX, TYPE 5 (MULTILAYER) WITH UNSUPPORTED HOLES, WITH OR WITHOUT STIFFENER
	APPROVED BY Thomas M. Hess	
	SIZE A / CAGE CODE 67268	DWG. NO. 11005
	REV	PAGE 1 OF 11

1. SCOPE

1.1 Scope. This drawing outlines the requirements for a type 5 (multilayer) flexible printed wiring board to be used as a qualification test specimen for qualifying to DoD printed board specifications.

1.2 Part or Identifying number (PIN). The complete PIN for the printed wring board shall be in accordance with 6.2.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL–PRF–50884 – Printed Wiring Board, Flexible or Rigid–Flex, General Specification For.

STANDARDS

DEPARTMENT OF DEFENSE

MIL–STD–130 – Identification Marking of U.S. Military Property.

(Copies of these documents are available online at https://assist.dla.mil/quicksearch or https://assist.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111–5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DRAWINGS

11006 – Printed Wiring Board, Flexible and Rigid–Flex, General Drawing.

(Copies of drawing 11006 is available online http://www.landandmaritime.dla.mil/programs/milspec/ListDwgs or can be obtained from DLA Land and Maritime (ATTN: code VAC), P.O. Box 3990, Columbus, OH 43218–3990.)

PUBLICATIONS

DLA Land and Maritime Form 19W – PWB–QPL Application/Authorization to Test.

(Copies of this publication are available online at http://www.landandmaritime.dla.mil/Offices/Sourcing_and_Qualification in the download section or can be obtained from DLA Land and Maritime (ATTN: code VQE), P.O. Box 3990, Columbus, OH 43218–3990.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

IPC – ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES (IPC)

IPC–2220	–	Design Standards Series.
IPC–2221	–	Printed Board Design, Generic Standard on.
IPC–2223	–	Sectional Design Standard for Flexible Printed Boards.
IPC–2511	–	Generic Requirements for Implementation of Product Manufacturing Description Data and Transfer XML Schema Methodology.
IPC–2615	–	Printed Board Dimensions and Tolerances.
IPC–T–50	–	Terms and Definitions for Interconnecting and Packaging Electronic Circuits.
IPC–D–325	–	Documentation Requirements for Printed Boards, Assemblies, and Support Drawings.
IPC–D–350	–	Printed Board Description in Digital Form.
IPC–OI–645	–	Standard for Visual Optical Inspection Aids.
IPC–9252	–	Guidelines and Requirements for Electrical Testing of Unpopulated Printed Boards.
J–STD–003	–	Solderability Tests for Printed Boards.
J–STD–609	–	Marking and Labeling of Components, PCBs and PCBAs to Identify Lead (Pb), Pb-Free and Other Attributes.

(Copies of these documents are available online at http://www.ipc.org or should be addressed to IPC – Association Connecting Electronics Industries, 3000 Lakeside Drive, Suite 309 S, Bannockburn, IL 60015–1249.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The individual item requirements for the printed wiring board shall be as specified herein and the associated electronic files (see 6.3). The finished printed wiring boards shall meet the requirements of this detail drawing, DLA Land and Maritime drawing 11006, and MIL–PRF–50884, type 5.

3.1.1 Dimensions and tolerances. The dimensions and tolerances shall be in accordance with IPC–2615. Unless otherwise specified herein, all dimensions are in inches. Unless otherwise specified, tolerances are ±.01 inch (0.25 mm) for two place decimals, ±.005 inch (0.12 mm) for three place decimals, and ± 2 degrees for angles.

3.1.2 Qualification inspection. Qualification inspection for the printed wiring board specified herein shall be required.

3.2 Definitions and terms. The definitions for all terms used herein shall be as specified in IPC–T–50, IPC–D–325, and those contained herein.

3.3 Conflicting requirements. In the event of conflict between the requirements of this drawing and other requirements of the qualifying approved DLA Land and Maritime Form 19W, the precedence in which documents shall govern, in descending order, is as follows:

a. The qualifying approved DLA Land and Maritime Form 19W.

b. This drawing.

c. Specifications, standards, and other documents referenced in section 2.

3.4 Material. Materials shall be as defined on DLA Land and Maritime drawing 11006 and herein. Unspecified materials shall be selected by the printed board manufacturer and shall be specified on DLA Land and Maritime Form 19W.

3.4.1 Base material, bonding layers and coverlayers.

3.4.1.1 Copper clad laminates. Copper clad base material used in the manufacturing of the printed wiring board shall have a minimum starting foil of 3/8 oz/ft (12 microns) or greater. Copper film for semi-additive and full additive copper plating is permitted provided the final conductor thickness is met. The copper clad base material used as the dielectric in the printed wiring boards shall be included in the PIN (see 6.2).

3.4.1.2 Bonding layers. The bonding layers used in the manufacturing of the printed wiring board shall be in accordance with DLA Land and Maritime drawing 11006.

3.4.1.3 Coverlayers. The coverlayers used in the manufacturing of the printed wiring board shall be in accordance with DLA Land and Maritime drawing 11006.

3.4.1.4 Material selection. The printed wiring board manufacturer shall select the base material, bonding layers, and coverlayers needed to create the board stack-up requirements of 3.5.1.

3.4.2 Conductor surface finish. The conductor surface finish shall be in accordance with DLA Land and Maritime drawing 11006. The conductor surface finish used on the printed wiring board shall be included in the PIN (see 6.2).

3.4.3 Copper plating. Copper plating shall be in accordance with DLA Land and Maritime drawing 11006. The copper plating shall have the following characteristics, the purity shall be 99.5 percent minimum, the elongation shall be 12 percent minimum, and the tensile strength shall be 248 MPa (36,000 psi) minimum.

3.4.4 Metallic foils. Copper foil and resin coated foils, if used, shall be in accordance with DLA Land and Maritime drawing 11006.

3.4.5 Marking ink. Marking ink shall be in accordance with DLA Land and Maritime drawing 11006.

3.4.6 Solder mask. Solder mask shall be in accordance with DLA Land and Maritime drawing 11006.

3.5 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified herein and on figures 1, 2, and 3. Unless otherwise specified, if individual design details are not specified on this detail drawing, then the baseline design parameters to be used for acceptability of finished printed wiring board requirements shall be the default design shall be performance class 3 of IPC–2221.

3.5.1 Board construction and cross sectional view. A cross sectional view of one possible stack-up of the finished printed wiring board is depicted on figure 1. The printed wiring board shall either have a stiffener attached to layer 4 (dash number T5–L04–S1) or shall have layers 1 and 4 made of rigid metal clad base material (dash number T5–L04–S2) in accordance with the material specification specified (see 6.2). Coverlayers shall not be bonded together in the flexible area.

3.5.1.1 Dielectric separation between layers. Unless otherwise specified on the qualifying activity approved DLA Land and Maritime Form 19W, the minimum dielectric thickness between layers shall be .0010 inch (0.025 mm) in the flexible area and .0015 inch (0.038 mm) in the rigid areas.

3.5.1.2 Overall printed board thickness. Unless otherwise specified on the qualifying activity approved DLA Land and Maritime Form 19W, the total thickness of the finished printed wiring board, when measured across all conductor surfaces, dielectric, platings, stiffeners, shall be from .040 to .080 inch (1.0 to 2.0 mm).

3.5.2 Bow and twist. Unless otherwise specified on the qualifying activity approved DLA Land and Maritime Form 19W, the maximum allowable bow and twist of the finished printed wiring board shall be no greater than .005 inch/inch (0.127 mm/mm) only on those areas of the printed wiring board that contain a stiffener.

3.5.3 Conductor pattern. The conductor patterns shall be generated from the supplied master pattern database (see 6.3) and represents the finished printed wiring board requirements with zero process allowance added for etch.

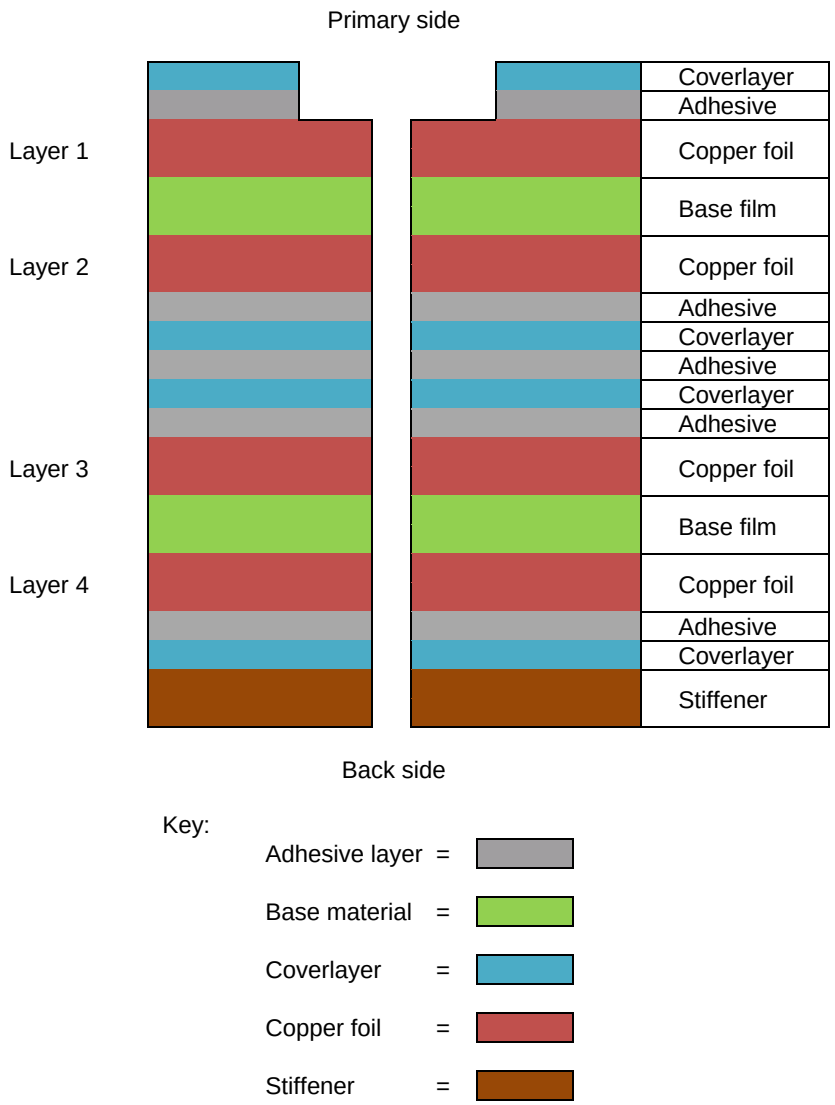


FIGURE 1. Cross sectional view (stack-up) without stiffener.

3.5.3.1 Annular ring. The minimum finished printed wiring board annular ring shall be .002 inch (0.051 mm) for unsupported holes.

3.5.3.2 Conductor spacing. The minimum finished printed wiring board conductor spacing shall be .005 inch (0.127 mm) for external conductors.

3.5.3.3 Conductor width. The finished printed wiring board conductors shall be within ±20 percent of the positions specified by the master pattern database.

3.5.3.4 Surface mount lands. If present, the finished printed wiring board surface mount lands shall be located within +.002 inch (0.051 mm) and –.001 inch (0.025 mm) of the positions specified by the master pattern database.

3.5.4 Holes and vias.

3.5.4.1 Hole diameter and tolerance. The diameter and tolerances of all holes on the printed wiring board are listed in table I and their general location shown on figure 2. The hole diameters specified in table I shall be the diameter of the finished hole after all plating processes.

3.5.4.1.2 Hole location. Unless otherwise specified, the coordinates for un-dimensioned drill hole locations shall be determined from the supplied drill report database and the hole data chart.

TABLE I. Hole schedule data chart.

Symbol	Description	Diameter inch (mm)	Design diameter inch (mm)	Quantity	Tolerance (+)	Notes
┼	Non-plated	.012 to .020 (0.31 to 0.51)	.016 (0.41)	36	.003	
X	Non-plated	.020 to .028 (0.51 to 0.71)	.024 (0.61)	36	.003	
⊠	Non-plated	.028 to .036 (0.71 to 0.91)	.032 (0.81)	52	.003	
All				124		

3.5.5 Profile (board outline). Figure 3 depicts the routing profile with test specimen identifiers. The minimum finished printed wiring board profile tolerance shall be in accordance with 3.1.1.

3.6 Processes. Not applicable to this drawing.

3.7 Performance requirements. The performance requirements shall be in accordance with MIL–PRF–50884. The following details shall apply.

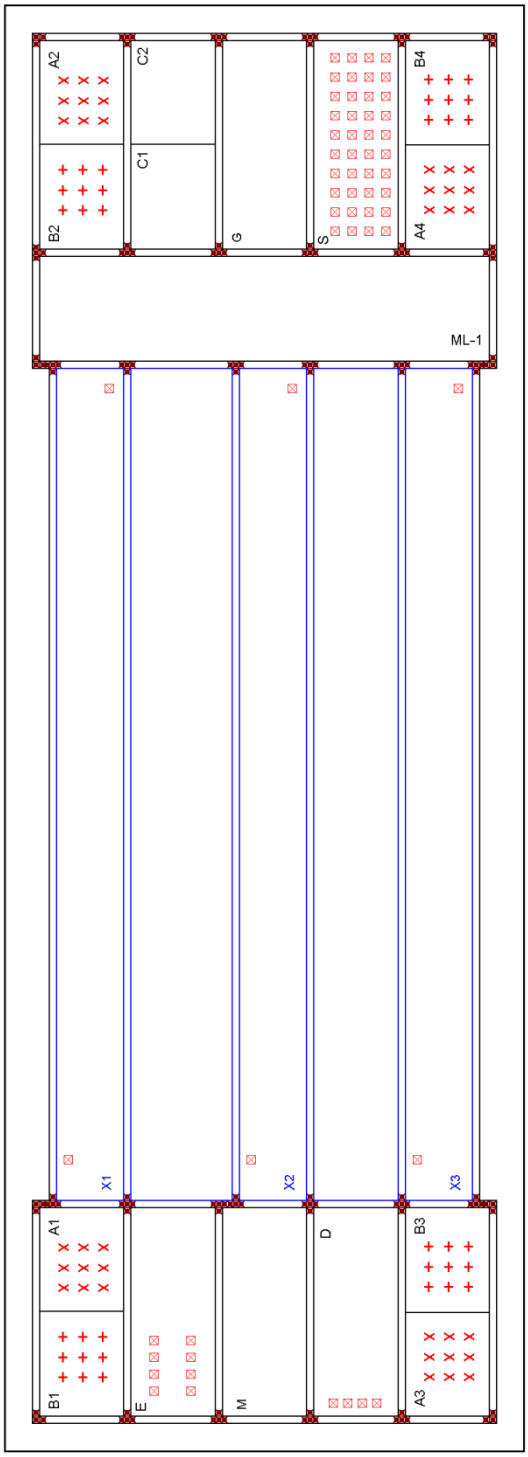
3.7.3.1 Ionic contamination. The level of ionic contamination on the printed wiring board shall not exceed an equivalent of 5.03 micrograms/square in. (0.78 micrograms/square centimeter) of sodium chloride.

3.7.2 Electrical requirements.

3.7.2.1 Electrical test. Each printed wiring board delivered shall be electrically tested for proper continuity using the provided documentation (Gerber or CAD extracted netlist or equivalent). A physical stamp or mark on the printed wiring board is required.

3.7.2.2 Impedance. Impedance testing is not required.

3.7.2.3 Maximum rated voltage. The maximum rated voltage of the printed wiring board is 36 volts DC.



NOTES:

1. Hole locations are in red. The hole symbols are described in table I.
2. Brown blocks between test coupons represent break-away tabs. The design and placement of the break-away tabs shall be at the discretion of the manufacturer.
3. Test coupon identifiers are shown for reference only.

FIGURE 2. Hole locations (viewed from layer 1).

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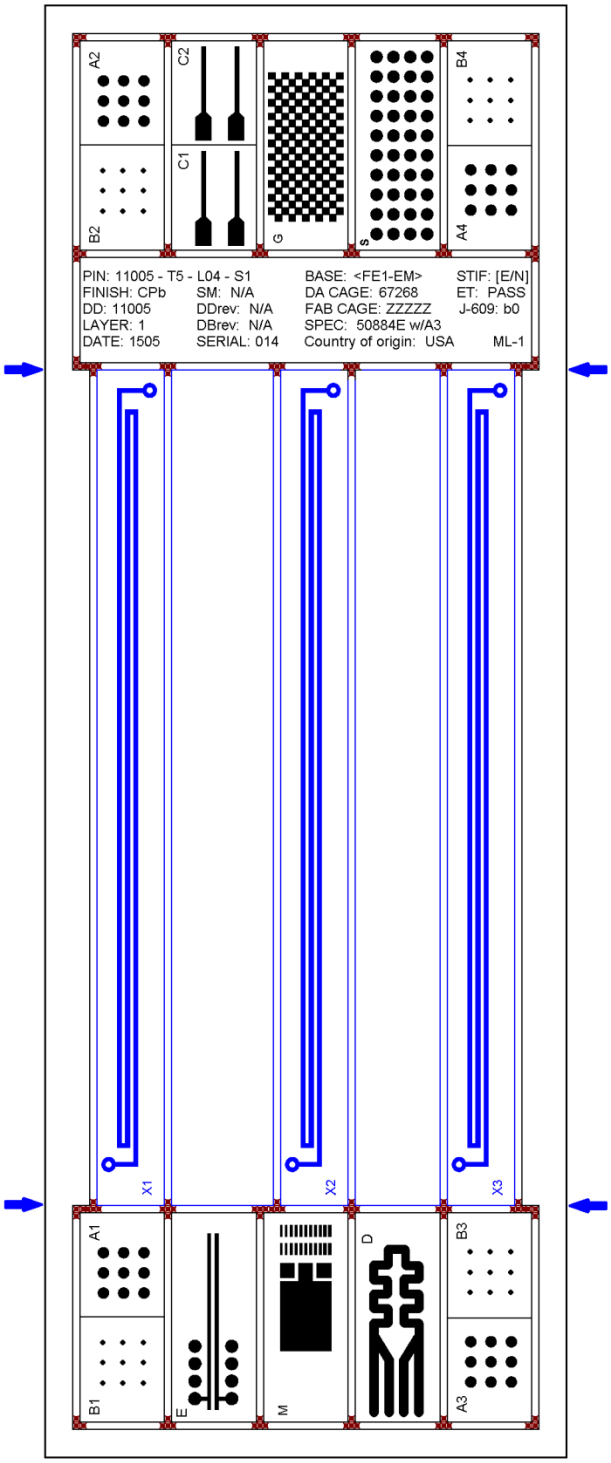

NOTES:

1. Conductor patterns are shown for reference only.
2. Brown blocks between test coupons represent break-away tabs. The design and placement of the break-away tabs shall be at the discretion of the manufacturer.
3. The flexible areas are shown in blue and the transition area identified with arrows.

FIGURE 3. Printed wiring board profile (viewed from layer 1).

3.8 Product indentification marking. The product identification marking shall include the complete DLA Land and Maritime PIN, the manufacturer's CAGE code, lot date code, and serial number. The following product identification codes may be part of the etched pattern: DLA Land and Maritime drawing number (DD), the DLA Land and Maritime drawing PIN (PIN), the manufacturer's CAGE code (CAGE), the performance specification status that the printed wiring board is tested to (SPEC). Unless otherwise specified on the qualifying activity approved DLA Land and Maritime Form 19W, when ink marking is used, is shall be of a color contrasting the material it is applied (base material or solder mask as applicable) and at least .06 inch (1.5 mm) in height.

3.8.1 Location. The Part or Identifying Number (PIN) shall be placed on the printed wiring board approximately where shown on coupon ML–1.

3.8.2 Lot date code. The lot date code shall be in accordance DLA Land and Maritime drawing 11006.

3.8.3 Serialization. Each printed wiring board on the panel shall be identified by a unique serial number code. When more than one printed wiring board is included on a panel, then each printed wiring board shall be traceable to its location on the production panel.

3.9 Quality conformance test circuitry (test coupons). The printed wiring board manufacturer shall place quality conformance test coupons on the production master and fabrication panel such that the design, location, and quantity meet the requirements for groups A and B inspection of MIL–PRF–50884.

3.10 Permissible fabricator allowances. The conductor patterns shall be generated from the supplied master pattern database (see 6.3) and represents the finished printed wiring board requirements with zero process allowance added for etch. The printed wiring board manufacturer can adjust the core and prepreg to achieve the desired impedance (if applicable) and final overall board thickness.

3.11 Configuration control. Configuration control shall be in accordance with DLA Land and Maritime drawing 11006.

4. VERIFICATION

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the drawing where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsible for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this drawing shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the performance specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contact. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material, either indicate or actual, nor does it commit the Government to accept defective material.

4.2 Qualification inspection. Qualification inspection for printed wiring boards specified herein is required.

4.3. Test coupon requirements. The number of test coupons present on the inspection panel to be used for the manufacturers test routine portion of qualification inspections shall be in accordance with appendix H of MIL–PRF–50884. The manufacturer may include additional test coupons for use in performing in-process testing.

5. PACKAGING

5.1 Packaging. Packaging shall be as specified in DLA Land and Maritime drawing 11006.

6. NOTES

6.1 Intended use. Printed wiring boards conforming to this drawing are intended for use in qualifying to Department of Defense printed board performance specifications.

6.2 PIN construction. The PIN shall be constructed using the following format:

11005–	T5 – L04 – S*	F	< * * – * * >	S [* / *]
Drawing number (see 6.2.1)	Dash number (see 6.2.2)	Base material style	Base material Identifier (see 6.2.3)	Stiffener material identifier top side / backside (see 6.2.4 if applicable)

6.2.1 Drawing number. The drawing number specifies what the general design and classification of the printed board described by the drawing. For this drawing, the design is a multilayered rigid-flex printed wiring board with plated–through holes. The printed board type shall be type 4 as defined in DLA Land and Maritime drawing 11006 and IPC–2223.

6.2.2 Dash number. The dash number specifies the type of board (T5), how many conductor layers (L04), and whether a stiffener is present on one side (S1) or both sides (S2). Currently, there are only two dash number available (T5–L04–S1) and (T5–L04–S2) representing a type 4 printed board with 4 conductor layers and a stiffener on either the backside (S1) or both sides (S2) of the printed board.

6.2.3 Base material identifier. The codes used to describe the base material shall be as defined in DLA Land and Maritime drawing 11006. The base materials (copper clad laminates and prepregs) shall be as identified on DLA Land and Maritime Form 19W and shall be encoded into the PIN.

6.2.4 Stiffener material. The stiffener material PIN designator shall consist of a two stiffener designators, separated by a slash mark. The codes used to describe the stiffener material shall be as defined in DLA Land and Maritime drawing 11006. The stiffener material shall be as identified on DLA Land and Maritime Form 19W. For the PIN on this drawing, the code would be "*/*" with the asterisks representing the code for the copper clad base material used on the rigid section of the printed wiring board.

6.3 Electronic data for 11005.

6.3.1 IPC–D–350 format (Gerber) files. The electronic data in IPC–D–350 format that are associated with this drawing shall be as identified within tables II and III. All values in the electronic data for conductor widths, pad sizes, and hole size are finished dimensions.

6.3.1.1 Route file information. Layer "DL11005.RF1" is the route file in Gerber format. The path delineates the outline of the finished printed wiring board.

TABLE II. Electronic data.

File name	Description	File type	Field
11005.PDF	This file	PDF	N/A
DL11005.DF1	Layer 1-4 unplated drill file (tooling)	Gerber	N/A
DL11005.DF2	Layer 1-4 drill file (through holes and vias)	Gerber	N/A
DL11005.RF1	Route file	Gerber	N/A
DL11005.CLB	Primary side coverlayer		
DL11005.CLT	Backside coverlayer		
DL11005.SMB	Backside stiffener	Gerber	Dark
DL11005.SMT	Primary side stiffener (dash S2 only)	Gerber	Dark
DL11005.L01	Layer 1	Gerber	Dark
DL11005.L02	Layer 2	Gerber	Dark
DL11005.L03	Layer 3	Gerber	Dark
DL11005.L04	Layer 4	Gerber	Dark

6.3.1.2 Gerber data format. The Gerber data formats associated with this drawing shall be as identified with table III. The Gerber data is in RS–274X format.

TABLE III. Gerber data format.

Attribute	Value
Character set	ASCII
Units	Inch
Format	2.5
Zero suppression	Leading
Mode	Absolute
EOL	* (asterisk)

6.3.2 Other types of data formats. Other data formats will be made available in the future. Please contact the preparing activity regarding the formats and availibilty.

6.3.3 Modifications. Requests for modifications to the qualification test specimens described on this drawing shall be made prior to, or at the time of, the request for qualification testing. Changes to the design or requirements of this detail drawing shall be listed on the authorization to test form, DLA Land and Maritime Form 19W and approved by the qualifying activity.

6.4 Comments. Comments on this drawing should be directed to DLA Land and Maritime, ATTN: code VAC, P.O. Box 3990 Columbus, Ohio 43216 or telephone (614) 692–0526, facsimile (614) 693–1642, or sent by electronic mail to: 5998.Documents@dla.mil.