1.0 GENERAL

1.1 Scope This specification covers the Compliant Press-Fit Pin for use in plated through holes in double-sided or multi-layer printed wiring boards. The specification is composed of the following sections:

1.2 Banned/Restricted Substances All product where the part number ends in “LF” meet the European Union directives and other country regulations as described in GS-22-008. The part numbers that do not end in “LF” meet all regulations except for Pb in SnPb plating, if available. Tin plated “LF” product has 100% tin plating in the interface and has not been tested for whisker growth in all interconnect environments.

2.0 APPLICABLE DOCUMENTS

2.1 Issues of Documents The following documents, of the issue in effect on the date of the latest revision of this specification, shall form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-N-290	Nickel Plating (Electrodeposited)
QQ-W-343	Wire Electrical and Nonelectrical, copper, (Uninsulated)
QQ-B-613	Brass, Leaded and Non-leaded
QQ-B-750	Bronze, Phosphor: Bar, Plate. Rod, Sheet, Strip, Flat Wire, and Structural and Special-Shaped Sections.

MILITARY

MIL-P-13949 Plastic sheet, Laminated, Metal-Clad (for printed wiring) General Specification for
MIL-G-45204 Gold Plating, Electrodeposited
MIL-P-55110 Printed Wiring Boards
MIL-P-81728 Plating, Tin-Lead (Electrodeposited)
MIL-P-45209 PALLADIUM Plating, (Electrodeposited)

STANDARDS
MILITARY

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-202 Test Methods for Electrical and Electronic Parts
MIL-STD-275 Printed Wiring for Electronic Equipment
MIL-STD-1130 Connections, Electrical Solderless Wrapped
MIL-STD-1344 Test Methods for Electrical Connectors
MIL-STD-45662 Calibration Systems Requirements

2.2 Other Publications. The following documents form a part of this specification to the extent specified herein:

American Society for Testing and Materials (ASTM) ASTM B-159-Phosphor Bronze Wire

3.0 REQUIREMENTS

3.1 Qualification Panel assemblies produced using Compliant Press-Fit Pins furnished under this specification shall be capable of meeting the qualification test requirements specified here. (See 5.1)

3.2 Material The material for each part shall be as specified herein, or equivalent. Substitute material shall meet the performance requirements of this specification.

3.2.1 Compliant Press-Fit Pins The pin shall be drawn wire phosphor bronze alloy UNS C-51000, in accordance with QQ-B-750 for the stamped version and in accordance with ASTM B-159, for the wire version.

3.2.2 Carrier The separable carrier (wire version only) shall be brass alloy UNS C-26000, in accordance with QQ-B-613.

3.3 Finish The Compliant Pin shall be plated with the specified thickness (see 5.2) of gold in accordance with MIL-G-45204, Type II, Grade C, over 1,27mm (50microinches) (minimum) nickel in accordance with QQ-N-290, Class 2, or with 3,81mm (120 microinches) (minimum) 93/7 tin-lead in accordance with MIL-P-81728, over 1,27mm (50 microinches) (minimum) nickel in accordance with QQ-N-290, Class 2. Lead free plating is also available with 2,54mm (100 microinches) tin in accordance with GS-46-001 (Confidential) over 1,27mm (50 microinches) (minimum) nickel in accordance with QQ-N-290, Class 2.

3.4 Design and Construction The compliant Pin shall be available in various above- and below-board lengths suitable for use as 2,64mm (0.025 inch) square male disconnects or as similarly configured wrappost for solderless wrapped connections, in accordance with MIL-STD-1130. The pin shall incorporate a compliant staking area providing mechanical stability of the free-standing pin in a plated-through-hole.

3.4.1 Installation The pin shall perform within the requirements of this specification when installed in a plated-through-hole having a finished diameter of 1,02mm ± , 08 (0.040 ± 0.003 inches).The pin shall accommodate any printed wiring board thickness from 2,36mm (0.093. (3/32) to 3,18mm (0.125 (1/8)) inches (nominal) and be capable of installation on minimum centers of 2.54mm (0.100 inch) (see Paragraph 5.4).

3.4.2 Wrappost The wrappost geometry shall be in accordance with MIL-STD-1130. The tip of the wrappost shall be beveled to facilitate insertion onto the bit of the wire wrap tooling.

3.4.3 Workmanship Pins shall be uniform in quality and shall be free from burrs, scratches, cracks, voids, chips, sharp edges, and other defects that will adversely affect life or serviceability.

3.5 Electrical Characteristics

3.5.1 Low-Level Circuit Resistance The low-level circuit resistance between the pin and the plated-through-hole shall not exceed 0.2 milliohms when (0.5 milliohms after environmental conditioning) when measured in accordance with MIL-STD-1344, Method 3002. The following details shall apply:

A. Test Current-100 ma, maximum (short-circuit)
B. Open Circuit voltage- 20 mv D.C., maximum
C. Method of Connection-attach current and voltage leads as shown in Figure 1

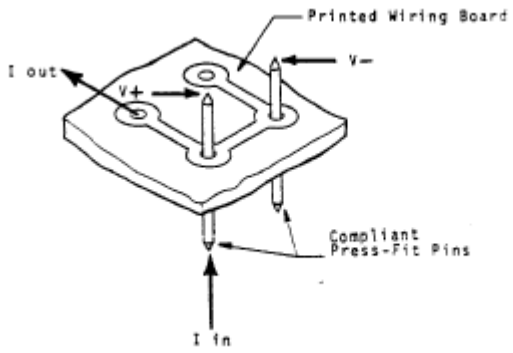


FIGURE 1-LOW-LEVEL CIRCUIT RESISTANCE

3.5.2 Wrapper Resistance The resistance between the wrappost and its terminating wire shall not exceed 2 milliohms when measured in accordance with MIL-STD1240; the following details shall apply:

A. Test Current-2.0 amperes D.C.
B. Method of Connection- attach current and voltage leads as shown in Figure 2

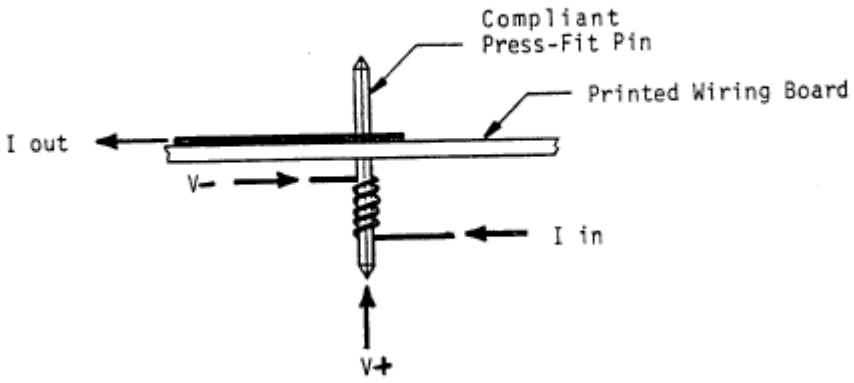


FIGURE 2- WRAPPER RESISTANCE

3.6 Mechanical Characteristics

3.6.1 Contact Retention A force of 44,40N (10 pounds) applied in either direction along the axis of the pin shall not displace the pin from its applied position in the printed wiring board. The force shall be applied at a crosshead speed of 2,54mm (1 inch) per minute with the peak load maintained for 5 to 10 seconds.

3.6.2 Wrappost Torque A torque of 0.021 Nm (3.0 ounce-inches) applied to the tip of the installed wrappost shall not cause yielding of this member, when tested in accordance with MIL-STD-202, Method 211, Condition E.

3.6.3 Stripping Force The force to strip a wrapped connection conforming to MIL-STD-1130 from the wrappost shall be not less than 8.88 N (2.0 lbs.) when measured in accordance with that specification and Figure 3.

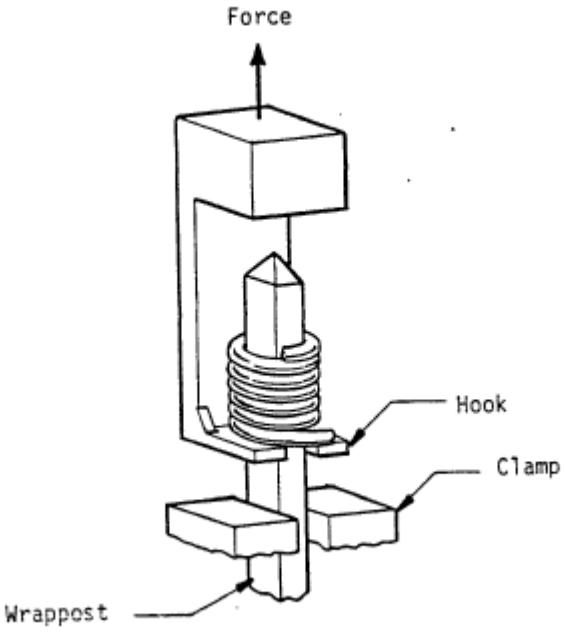
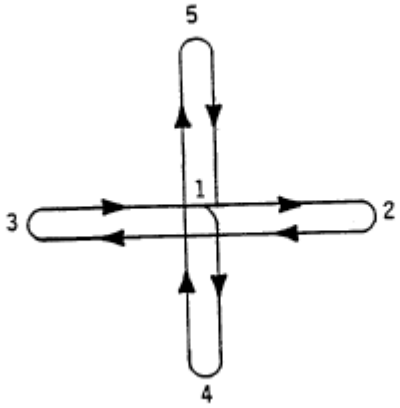


FIGURE 3- STRIPPING FORCE

3.6.4 Tail Straightening After tail straightening of either end, the pin shall exhibit no change in position of the opposite end and shall meet all electrical and mechanical requirements of this specification. The following details shall apply:

A. Deflection- ,89mm (0.035 inch) (in any direction)
B. Plane of Bending- parallel to sides of wrappost
C. Pattern - see Figure 4
D. Tooling Bar Location - 3,81mm (0.150 inch) from board



Sequence: 1-2-1-3-1-4-1-5-1

FIGURE 4- TAIL STRAIGHTENING PATTERN

3.6.5 Pin Replacement After the installation of the third new pin in the same plated-through-hole, the pin shall meet all electrical and mechanical requirements of this specification.

3.7 Environmental Conditions

3.7.1 Thermal Shock After exposure of the assembly to alternate periods of extreme high and low temperatures, the contact retention shall be not less than 44,40N (10 pounds) (see Paragraph 3.6.1). The test shall be in accordance with MIL-STD-1344, Method 1003, Condition A ; the following details shall apply:

A. Temperature Range - +85□ C to - 55 □ C
B. Time at Temperature - 30 minutes each per cycle
C. Transfer Time - 5 minutes, maximum
D. Number of Cycles - 5

3.7.2 Humidity After exposure of the assembly to a high-humidity environment, the low-level circuit resistance shall not exceed 0.5 milliohms (see Paragraph 3.5.1) The test shall be in accordance with MIL-STD-1344, Method 1002, Type I , Condition B, the following details shall apply:

A. Relative Humidity - 90% minimum
B. Temperature - + 40 □ C
C. Test Duration - 96 hours

3.7.3 High-Temperature Life After exposure of the nonoperating assembly to a high-temperature environment, the low-level circuit resistance shall not exceed 0.5 milliohms (see Paragraph 3.5.1) and the contact retention shall not be less than 44,40N (10 pounds) (see Paragraph 3.6.1). The test shall be in accordance with MIL-STD-1344, Method 1005, Test Condition 3, Time Condition D; the following details shall apply:

A. Exposure Temperature - + 85°C
B. Exposure Time - 1000 hours

3.7.4 Shock There shall be no evidence of damage when the assembly is subjected to transient accelerations. The test shall be in accordance with MIL-STD-1344, Method 2004.1, Condition A; the following details shall apply:

A. Shock Pulse- 50g peak, 11 millisecond, half-sine
B. Number of Shocks - 3 shocks in each direction along three orthogonal axes (18 total)
C. Mounting - see Figure 5

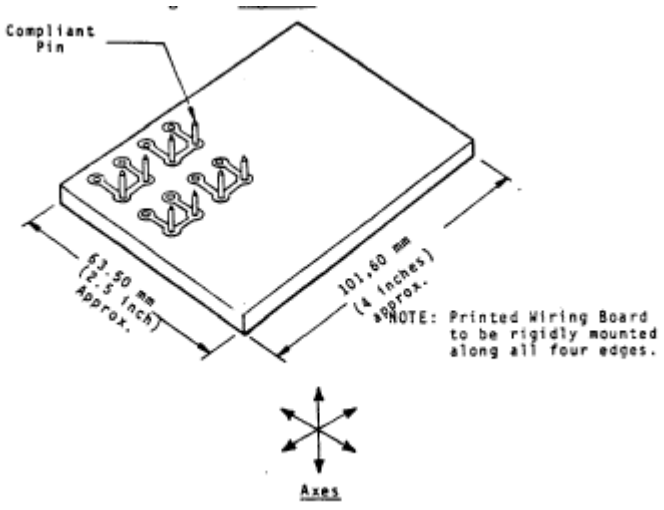


FIGURE 5 - MOUNTING FOR SHOCK AND VIBRATION

3.7.5 Vibration There shall be no evidence of damage when the assembly is subjected to prolonged mechanical vibration; after the test, the contact retention shall not be less than 44,40N (10 pounds) (see Paragraph 3.6.1). The test shall be in accordance with MIL-STD-1344, Method 2005, Condition III; the following details shall apply:

A. Vibration Amplitude - 1,52mm (0.06 inch) DA or □ 15g
B. Frequency Range - 10 to 2000 Hz
C. Test Duration - 4 hours along each of three orthogonal axes (12 hours total)
D. Mounting - see Figure 5

3.7.6 Hydrogen Sulfide (H 2 S) After exposure of the assembly to a sulfurous environment , the low-level circuit resistance shall not exceed 0.5 milliohms (see Paragraph 3.5.1). The following details shall apply:

A. Atmosphere - 3 PPM H 2 S, in moist air
B. Temperature - + 40 □ C
C. Duration - 96 hours

3.7.7 Salt Spray After exposure of the assembly to a salt fog atmosphere, the low-level circuit resistance shall not exceed 0.5 milliohms (see Paragraph 3.5.1). The test shall be in accordance with MIL-STD-1344, Method 1001, Condition B; the following details shall apply:

A. Salt Solution - 5% (by weight)
B. Duration - 48 hours

3.7.8 Gas Tightness After exposure of the terminated wrappost to successively applied aqua regia and ammonium sulfide gas environments, the wrapper resistance shall not exceed 2 milliohms (see Paragraph 3.5.2), and a minimum of 75 percent of the corners in contact with uninsulated wire shall appear bright, when contrasted with the discolored pin surface, The test shall be in accordance with MIL-STD-1130.

4.0 Quality assurance Provisions

4.1 Equipment Calibration All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with MIL-STD-45662.

4.2 Inspection Conditions Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

A. Temperature - + 25˚ C ±5 ˚C
B. Relative Humidity - 30 to 80 %
C. Barometric Pressure - local ambient

4.3 Qualification Inspection Qualification inspection shall be performed on sample units produced with equipment and procedures normally used in production.

4.3.1 Sample Six hundred forty (640) stamped pins and similar quantity of drawn wire pins of length suitable for tail straightening (see Paragraph 3.6.4), shall be subjected to the qualification inspection.

4.3.2 Preparation of Sample Boards

4.3.2.1 Printed Wiring Boards Four (4) test boards conforming to the applicable requirements of MIL-P-55110 and MIL-STD-275, shall be prepared as shown in Figure 6. Board thickness and finished hole size combinations, for the indicated sample board number, shall be in accordance with Table 1.

Table I - Board Configuration

Board Thickness	Finished Hole Diameter	
	Max.	Min.
2,36mm (.093 inches)	1,3	4
3,18mm (.125 inches)	--	2

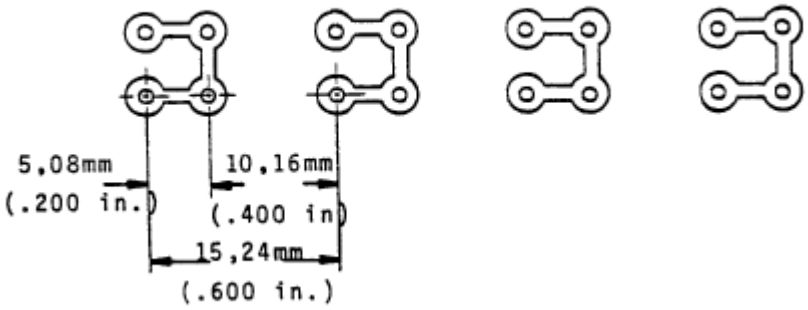


FIGURE 6 - PRINTED WIRING BOARD (TEST)

4.3.2.2 Sample Installation Pins shall be installed in each printed wiring test board in four (4) rows of forty (40) each, as shown in Figure 7. One-half of the pins in each row shall be removed and replaced with new pins two times (third use of plated through-hole). One (1) row of the stamped pins and one (1) row of the drawn wire pins shall be tail-straightened (see Paragraph 3.6.4).

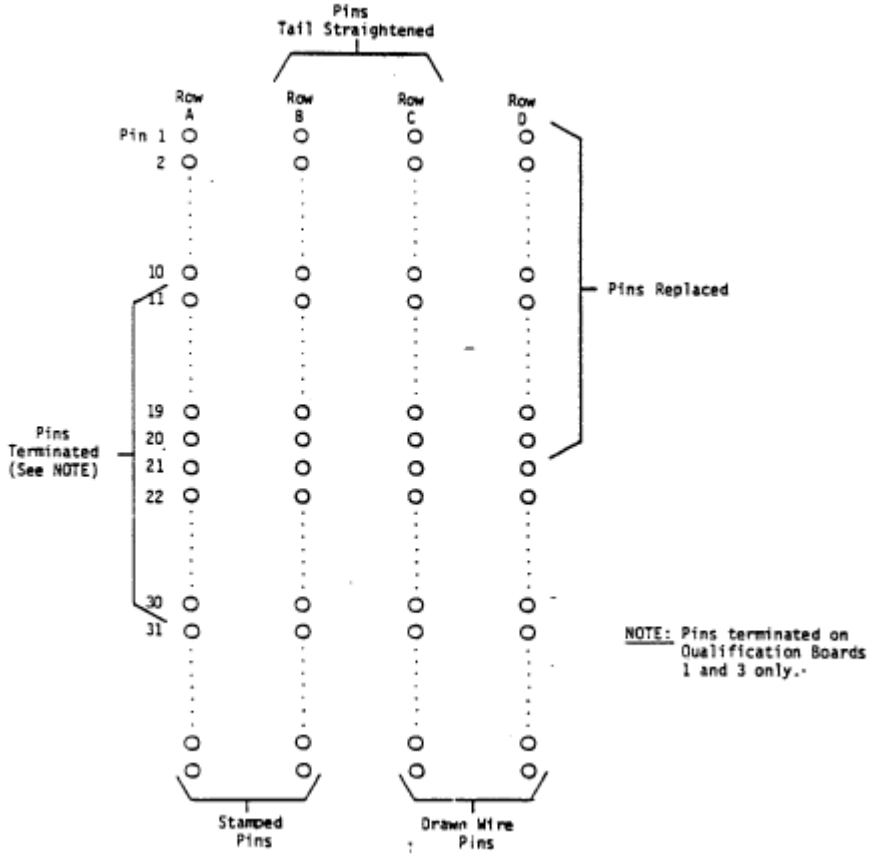


FIGURE 7 - TEST SAMPLE CONFIGURATION

4.3.2.3 Wirewrap Termination The wrappost of pons 11 through 30 of rows B and C in sample board numbers 1 and 3 shall be terminated with AWG 28 uninsulated wire in accordance with QQ-W-343, Type S, soft-drawn and annealed. The solderless wrap connections shall conform to the requirements of MIL-STD-1130, for Class B (conventional wrap) termination's.

4.3.3 Test Sequence The assemblies shall be subjected to the inspections specified in Table II, in the order shown.

TABLE II - QUALIFICATION INSPECION

Examination or Test	Paragraph	Sample Board Number 1	2	3	4
Contact Retention / 1	3.6.1	/2	/2	/2	/2
Low-Level Circuit Resistance	3.5.1	X	X	X	X
Thermal Shock / 1	3.7.1	X	X	-	-
Humidity	3.7.2	X	X	-	-
High Temperature Life	3.7.3	X	X	-	-
Shock	3.7.4	-	-	X	X
Vibration /1	3.7.5	-	-	X	X
Hydrogen Sulfide	3.7.6	-	-	-	X
Salt Spray	3.7.7	-	-	-	X
Wrappost torque	3.6.2	/3	/3	/3	/3
Contact Retention (to failure)	3.6.1	/2	/2	/2	/2
Stripping Force	3.6.3	\4	\4	\4	-
Gas Tightness	3.7.8	\5	-	\5	-

/1 Apply fixed load of 44,40N (10 pounds) only for contact retention.
/2 Pins 1 to 10 and 31 to 40 in each row only.
/3 Pins 1 to 10 in each row.
/4 Pins 11 to 20 in rows B and C only.
/5 Pins 21 to 30 in rows B and C only.

4.4 Quality conformance Inspection Quality conformance inspection shall be performed on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample Three hundred twenty (320) stamped pins and a similar quantity of drawn wire pins of length suitable for tail straightening (see Paragraph 3.6.4) shall be selected at random from pins produced every 36 months and subjected to quality conformance inspection.

4.4.2 Preparation of Samples

4.4.2.1 Printed Wiring Boards Two (2) test boards conforming to the applicable requirements of MIL-P-55110 and MIL-STD-275 shall be prepared as shown in Figure 6. The boards shall be 2,36mm (0.093 inch) thick and have plated-through-holes of maximum finished diameter.

4.4.2.2 Sample Installation Pins shall be installed in each printed wiring test board in four (4) rows of forty (40) each as shown in Figure 7. One-half of the pins in each row shall be removed and replaced with new pins two times (third use of plated-through-hole). One (1) row of the stamped pins and one (1) row of the drawn wire pins shall be tail-straightened (see Paragraph 3.6.4)

4.4.3 Test Sequence The assemblies shall be subjected to the inspections specified in Table III, in the order shown.

TABLE III - QUALITY CONFORMANCE INSPECTION

Examination Test	Paragraph	SAMPLE BOARD NUMBER 1	2
Contact Retention /1	3.6.1	/2	/2
Low-Level Circuit Resistance	3.5.1	X	X
Thermal Shock/1	3.7.1	X	-
Humidity	3.7.2	X	-
High Temperature Life/1	3.7.3	X	-
Hydrogen Sulfide	3.7.6	-	X
Salt Spray	3.7.7	-	X
Wrappost Torque	3.6.2	/3	-
Contact Retention (to failure)	3.6.1	X	-

/1 Apply fixed load of 44,40N (10 pounds) only for contact retention.
/2 Pins 1 to 10 and 31 to 41 in each row.
/3 Pins 11 to 30 in each row.

4.4.4 Test Failures If a pin fails to pass the quality conformance inspection, appropriate corrective action shall be taken on the materials or processes and additional samples shall be subjected to the quality conformance inspection to verify the effectiveness of the action.

4.5 Acceptance Inspection Acceptance inspection of the pins shall consist of the examinations specified in Table IV (see Paragraph 5.5).

4.5.1 Inspection Lot An inspection lot shall consist of al pins produced under essentially the same conditions and offered for inspection at one time.

TABLE IV - ACCEPTANCE INSPECTION

Examination	AQL Major	AQL Minor
Visual and Mechanical	1.0%	4.0%

4.5.2 Sampling Plan Statistical sampling and inspection shall be in accordance with MIL-STD-105, General Inspection Level II. The Acceptable Quality Level (AQL) of the delivered product shall be as specified in Table IV. Major and minor defects shall be as defined in MIL-STD-105.

4.5.3 Rejected Lots Rejected lots shall be screened to remove defective units and resubmitted for inspection.

5.0 Notes and Definitions

5.1 Printed Wiring Boards The laminate used in the fabrication of printed wiring boards shall be Type GE* **** A1/1A A/1/B, in accordance with MIL-P-13949, or equivalent. Plated-through holes shall be constructed as follows:

A. Drilled Hole Diameter - 1,15 ± ,025mm (0.0453± 0.0010 inches)
B. Copper Plating Thickness - ,025mm (0.001 inches) (minimum)
C. Tin-Lead (60/40) Plating Thickness - ,00762mm (0.0003 inches) (minimum) ; ,01778mm (0.0007 inches) (maximum).

- *N or P is optional
- **** 0930 or 1250, as appropriate

5.2 Plating The standard pin is available with thickness of gold plating ranging from ,38 to 1,27mm (15,30,50 microinches). Selective placement of gold and duplex platings are available. Also, the pin plated with palladium alloy with gold flash is available.

5.3 Pin Lengths The standard pin is available in a variety of installed lengths as follows:

Pin Version	Relation to Board	LENGTH- MM (INCHES) Minimum	Maximum
Stamped /2	Above	6,350 (.250)	8,13 (.320)
	Below	6,275 (.247)	14,94 (.588)
Drawn Wire	Above	5,59 (.220)	18,90 (.745)
	Below	1,475 (.058)	18,60 (.733)

/1 Based upon 2.36mm (0.0930 inch) thick board.
/2 Lengths include 1,02mm (0.040 inch) high spade.

5.4 Thickness of Printed Wiring Board Depending upon the application, gold retention and electrical stability can be obtained with the pins installed in printed wiring boards 2.36mm (0.0938 inches) (nominal) thickness. Mechanical stability under side-loading such as encountered during tail-straightening may not conform to the requirements of this specification.

5.5 Acceptance Inspection Appropriate in -process inspection may, at the option of FCI, be substituted for the indicated lot sampling/inspection provided that the process output quality level is maintained.

Revision Record

REV.	PAGE	DESCRIPTION	EC #	DATE
A	All	Error in specification	8753	08/16/82
B	All	Update specification	9140	02/09/83
C	All	Update specification per markups	V71812	01/13/98
D	ALL	Make corrections on all pages where indicated	V80200	01/23/98
E	ALL	Revised format to be consistent with GS-01-001, and change BERG, Dupont, etc. references to FCI.	V01904	07/28/00
F	1, 2	Add section 1.2 and tin plating to section 3.3	V05-1111	12/13/05
G	All	Change logo	V06-0526	05/31/06

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