IPC/JPCA-6202

Performance Guide
Manual for Single- and Double-Sided Flexible Printed Wiring Boards

IPC/JPCA-6202
February 1999
A joint standard developed by IPC and JPCA
# Table of Contents

1 SCOPE .................................................................................................................. 1

2 REFERENCED DOCUMENTS .............................................................................. 1
  2.1 Japan Printed Circuits Association................................................................. 1
  2.2 International Electrotechnical Commission .................................................. 1
  2.3 IPC ................................................................................................................... 1

3 DEFINITION OF TERMS ...................................................................................... 1

4 TEST METHODS .................................................................................................... 1

5 PERFORMANCE LEVELS .................................................................................... 1

6 BASE MATERIALS ................................................................................................ 2

7 VISUAL INSPECTION ............................................................................................ 2
  7.1 Test Environment ........................................................................................... 2
  7.2 Test Specimens ............................................................................................... 2
  7.3 Tools for Testing ............................................................................................. 2
  7.4 Preparation of Limit Samples ........................................................................ 2
  7.5 Description of Inspections ............................................................................. 2
    7.5.1 Visual Inspection of Conductors ............................................................... 2
    7.5.2 Visual Inspection of Base Film ................................................................. 3
    7.5.3 Visual Inspection of Coverlay and Covercoat ........................................ 4
    7.5.4 Visual Inspection of Plating .................................................................... 5
    7.5.5 Visual Inspection of Edges of Outline and Holes .................................. 8
    7.5.6 Visual Imperfections Related to Stiffener Bonding ............................... 8
    7.5.7 Other Visual Inspection .......................................................................... 10

8 DIMENSIONAL INSPECTIONS ............................................................................ 11
  8.1 Measurement of Dimensions ....................................................................... 11
  8.2 External dimensions ....................................................................................... 11
  8.3 Thickness ......................................................................................................... 11
  8.4 Holes ................................................................................................................ 11
    8.4.1 Component Holes .................................................................................... 11
    8.4.2 Vias .......................................................................................................... 11
    8.4.3 Mounting Holes ....................................................................................... 11
  8.5 Conductor Widths ........................................................................................... 11
  8.6 Clearances Between Conductors .................................................................... 11
  8.7 Distance Between Hole Centers .................................................................... 11
  8.8 Minimum Distance Between Board Edges and Conductors ....................... 11
  8.9 Positional Accuracy ....................................................................................... 11
    8.9.1 Positional Accuracy of Holes ................................................................. 11
    8.9.2 Registration of Hole to Land ................................................................. 12
    8.9.3 Registration of Coverlay (or Covercoat) to Land ................................. 12
  8.9.4 Registration of Stiffener to FPC ............................................................... 13
  8.9.5 Registration of Punched Outline to Conductor Patterns ........................ 13
  8.9.6 Registration of Pressure Sensitive or Heat Activated Adhesives (Including Adhesive Squeeze-Out) to Flexible Printed Board and Stiffener .............................................................. 13
  8.9.7 Registration of Through Holes and Stiffener ........................................ 13
  8.9.8 Registration of Pressure Sensitive or Heat Activated Adhesives (Including Adhesive Squeeze-Out) to Flexible Printed Board and Stiffener .............................................................. 13
  8.9.9 Registration of Through Holes and Stiffener ........................................ 13
  8.9.10 Registration of Through Holes and Stiffener ...................................... 13
  8.9.11 Registration of Through Holes and Stiffener ....................................... 13
  8.9.12 Registration of Through Holes and Stiffener ...................................... 13

9 TESTING OF ELECTRICAL PERFORMANCE ............................................. 13

10 TESTING OF MECHANICAL PERFORMANCE ............................................ 13

11 ENVIRONMENTAL PERFORMANCE ............................................................. 13

12 MIGRATION ........................................................................................................ 13

13 CHEMICAL RESISTANCE .............................................................................. 14

14 CLEANLINESS ................................................................................................ 14

15 FLAME RESISTANCE ....................................................................................... 14

16 MARKING, PACKAGING, AND STORAGE .................................................... 16
  16.1 Marking on Products .................................................................................... 16
  16.2 Marking on Package ..................................................................................... 16
  16.3 Packaging and Storage ............................................................................... 16
    16.3.1 Packaging ............................................................................................... 16
    16.3.2 Storage .................................................................................................. 16
    16.3.3 Handling ............................................................................................... 16

Appendix I ............................................................................................................... 17

Appendix II ............................................................................................................. 18

Appendix III ............................................................................................................ 20

## Figures

Figure 1 Nicks and Pinholes in Conductor ............................................................... 2
Figure 2 Reduced Area on Land ............................................................................. 2
Figure 3 Circumferential Void at the Component Hole Corner ............................... 3
Figure 4 Extraneous Copper Between Conductors/Spurs and Nodules of Conductors Corner .............................................................................................................. 3
Figure 5 Extraneous Copper and Spurs and Nodules in Open Area and Nodules of Conductors Corner .............................................................................................................. 4
Figure 6 Etched Concave on Conductor Surface and Nodules of Conductors Corner .............................................................................................................. 4
Figure 7 Conductor Delamination ........................................................................... 4
Figure 8 Scratches on Conductor ........................................................................... 4
Figure 9 Dents ......................................................................................................... 5
Table 8  Dents ................................................................. 5
Table 9  Allowable Scratches on Base Film ..................... 5
Table 10  Dents on Coverlay and Covercoat .................... 5
Table 11  Requirements for Scratches on Coverlayer and Covercoat ........................................... 5
Table 12  Allowable Voids .............................................. 6
Table 13  Allowable Non-Conductive Foreign Materials (mm) ...................................................... 6
Table 14  Allowable Squeeze-Out of Coverlay Adhesive and Ooze-out of Covercoat ..................... 7
Table 15  Minimum Solderable Annular Ring on Land Area ......................................................... 8
Table 16  Gold Plating ..................................................... 8
Table 17  Requirements for Metal Penetration Between Conductor and Coverlay .......................... 9
Table 18  Requirements for Metal Penetration Between Conductor and Base Film ....................... 9
Table 19  Gold Plating ..................................................... 9
Table 20  Allowable Plating Voids ................................. 9
Table 21  Cracks ............................................................ 11
Table 22  Thermosetting Adhesives on Surface ............ 12
Table 23  Flux Residue on Surface ................................. 12
Table 24  Residue of Metal Powders (Solder, Aluminum, Copper, Etc.) ........................................ 12
Table 25  Residue of Adhesive ......................................... 12
Table 26  Tolerance of External Dimension ................. 13
Table 27  Requirements for Holes ................................. 13
Table 28  Requirements for Vias .................................... 13
Table 29  Conductor Widths and Tolerances (mm) ....... 14
Table 30  Conductor Clearances and Tolerances (mm) ... 14
Table 31  Tolerance of Distance Between Hole Centers ... 13
Table 32  Minimum Distance between Board Edges and Conductors ......................................... 13
Table 33  Allowable Misregistration of Outlines .......... 14
Table 34  Registration of Punched Outline to Conductor Patterns ............................................. 14
Table 35  Electrical Properties of Flexible Printed Boards ......................................................... 15
Table 36  Mechanical Properties of Flexible Printed Boards ...................................................... 15
Table 37  Environmental Tests and Requirements .......... 16
Table 38  Requirements for Packaging .......................... 16
1 SCOPE
This standard covers the requirements and considerations for single- and double-sided flexible printed wiring boards (hereinafter called “flexible printed boards” or FPC).
In this document, a FPC means a single- or double-sided FPC, using a film of polyester or polyimide laminated with copper foil(s) on one or both sides (including types with no adhesive layer), and manufactured by the subtractive method (excluding the build-up methods for the manufacturing process).

2 REFERENCED DOCUMENTS
The referenced documents for this standard are as stated in 2.1 through 2.3.

2.1 Japan Printed Circuits Association

JIS C 5016 (1994) Test Methods for Flexible Printed Wiring Boards

JIS C 5017 (1994) Flexible Printed Wiring Boards - Single-Sided and Double-Sided

JIS C 5603 (1993) Terms and Definitions for Printed Circuits

JIS C 6471 (1995) Test Methods of Copper-Clad Laminates for Flexible Printed Wiring Boards

JIS C 6472 (1995) Copper-Clad Laminates for Flexible Printed Wiring Boards (Polyester Film, Polyimide Film)

JIS C 6512 (1992) Electrolytic Copper Foil for Printed Wiring Boards

JIS C 6513 (1996) Rolled Copper Foil for Printed Wiring Boards

JPCA-FC03 (1992) Specification for External Appearance of Flexible Printed Wiring Boards

2.2 International Electrotechnical Commission


These IEC documents are, however, being reviewed for substantial revision at the time of enactment of this document.

2.3 IPC


IPC-A-600 Acceptability of Printed Boards


2.4.13 Solder Float Resistance Flexible Printed Wiring Materials

3 DEFINITION OF TERMS
The definition of terms used in this document is in conformance with JIS C 5603, JIS C 5017, JIS C 5016, and JPCA-FC03.

4 TEST METHODS
The test methods for the properties specified in this document are, in principle, in conformance with JIS C 5016, provided:

1. Test methods requiring complicated referencing procedures are reproduced in this document.
2. Tests on through connection apply to double-sided FPCs only.
3. For stiffeners affixed to FPCs, external appearance is the only requirement specified in this document.

5 PERFORMANCE LEVELS
The FPCs are classified into three standard levels and one special level regarding their performance for each requirement. These are defined as follows:

Level 1 – FPCs requiring “ordinary” performance levels
Level 2 – FPCs requiring “high” performance levels

1. JPCA, Kairo Kaikan 2F, 12-2, Nishiogikita 3-Chome, Suginami-Ku, Tokyo, 167, Japan, +81-3-5310-2020, www.jpca.org
2. ANSI, 11 W. 42nd St., New York, NY 10036, 212-642-4980, www.ansi.org