



ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

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Generic Standard on
Printed Board Design

IPC-2221A

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February 1998

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Generic Standard on Printed Board Design

Developed by the IPC-2221 Task Group (D-31b) of the Rigid Printed Board Committee (D-30) of IPC

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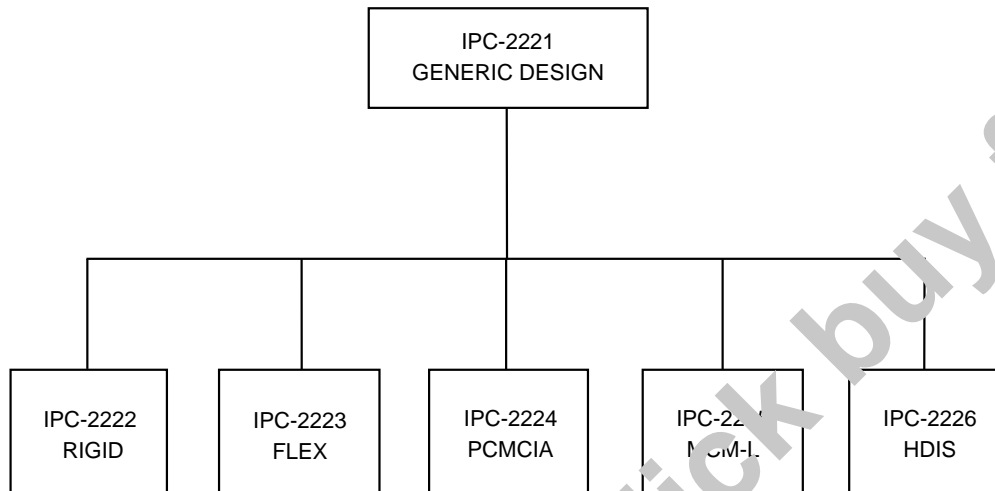
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HIERARCHY OF IPC DESIGN SPECIFICATIONS
(2220 SERIES)



FOREWORD

This standard is intended to provide information on the generic requirements for organic printed board design. All aspects and details of the design requirements are addressed to the extent that they can be applied to the broad spectrum of those designs that use organic materials or organic material in combination with inorganic materials (metal, glass, ceramic, etc.) to provide the structure for mounting and interconnecting electronic, electromechanical, and mechanical components. It is crucial that a decision pertaining to the choice of product types be made as early as possible. Once a component mounting and interconnecting technology has been selected, the user should obtain the sectional document that provides the specific focus on the chosen technology.

It may be more effective to consider alternative printed board construction types for the product being designed. As an example the application of a rigid-flex printed wiring board may be more cost or performance effective than using multiple printed wiring boards, connectors and cables.

IPC's documentation strategy is to provide distinct documents that focus on specific aspect of electronic packaging issues. In this regard document sets are used to provide the total information related to a particular electronic packaging topic. A document set is identified by a four digit number that ends in zero (0).

Included in this set is the generic information which is contained in the first document of the set and identified by the four digit set number. The generic standard is supplemented by one or many sectional documents each of which provide specific focus on one aspect of the topic or the technology selected. The user needs, as a minimum, the generic design document, the sectional of the chosen technology, and the engineering description of the final product.

As technology changes specific focus standards will be updated, or new focus standards added to the document set. The IPC invites input on the effectiveness of the documentation and encourages user response through completion of "Suggestions for Improvement" forms located at the end of each document.

Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the IPC-2221 Task Group (D-31b) of the Rigid Printed Board Committee (D-30) are shown below, it is not possible to include all of those who assisted in the evolution of this Standard. To each of them, the members of the IPC extend their gratitude.

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Generic Standard on Printed Board Design

1 SCOPE

This standard establishes the generic requirements for the design of organic printed boards and other forms of component mounting or interconnecting structures. The organic materials may be homogeneous, reinforced, or used in combination with inorganic materials; the interconnections may be single, double, or multilayered.

1.1 Purpose The requirements contained herein are intended to establish design principles and recommendations that **shall** be used in conjunction with the detailed requirements of a specific interconnecting structure sectional standard (see 1.2) to produce detailed designs intended to mount and attach passive and active components. This standard is not intended for use as a performance specification for finished boards nor as an acceptance document for electronic assemblies. For acceptability requirements of electronic assemblies, see IPC/EIA-J-STD-001 and IPC-A-610.

The components may be through-hole, surface mount, fine pitch, ultra-fine pitch, array mounting or unpackaged bare die. The materials may be any combination able to perform the physical, thermal, environmental, and electronic function.

1.2 Documentation Hierarchy This standard identifies the generic physical design principles, and is supplemented by various sectional documents that provide details and sharper focus on specific aspects of printed board technology. Examples are:

IPC-2222	Rigid organic printed board structure design
IPC-2223	Flexible printed board structure design
IPC-2224	Organic, PC card format, printed board structure design
IPC-2225	Organic, MCM-L, printed board structure design
IPC-2226	High Density Interconnect (HDI) structure design
IPC-2227	Embedded Passive Devices printed board design (In Process)

The list is a partial summary and is not inherently a part of this generic standard. The documents are a part of the PCB Design Document Set which is identified as IPC-2220. The number IPC-2220 is for ordering purposes only and will include all documents which are a part of the set, whether released or in-process proposal format at the time the order is placed.

1.3 Presentation All dimensions and tolerances in this standard are expressed in hard SI (metric) units and paren-

thetical soft imperial (inch) units. Users of this and the corresponding performance and qualification specifications are expected to use metric dimensions.

1.4 Interpretation “**Shall**,” the imperative form of the verb, is used throughout this standard whenever a requirement is intended to express a provision that is mandatory. Deviation from a “**shall**” requirement may be considered if sufficient data is supplied to justify the exception.

The words “should” and “may” are used whenever it is necessary to express nonmandatory provisions. “Will” is used to express a declaration of purpose.

To assist the reader, the word “**shall**” is presented in bold characters.

1.5 Definition of Terms The definition of all terms used herein **shall** be as specified in IPC-T-50.

1.6 Classification of Products This standard recognizes that rigid printed boards and printed board assemblies are subject to classifications by intended end item use. Classification of producibility is related to complexity of the design and the precision required to produce the particular printed board or printed board assembly.

Any producibility level or producibility design characteristic may be applied to any end-product equipment category. Therefore, a high-reliability product designated as Class “3” (see 1.6.2), could require level “A” design complexity (preferred producibility) for many of the attributes of the printed board or printed board assembly (see 1.6.3).

1.6.1 Board Type This standard provides design information for different board types. Board types vary per technology and are thus classified in the design sectionals.

1.6.2 Performance Classes Three general end-product classes have been established to reflect progressive increases in sophistication, functional performance requirements and testing/inspection frequency. It should be recognized that there may be an overlap of equipment between classes. The printed board user has the responsibility to determine the class to which his product belongs. The contract **shall** specify the performance class required and indicate any exceptions to specific parameters, where appropriate.

Class 1 General Electronic Products Includes consumer products, some computer and computer peripherals, as well as general military hardware suitable for applications where cosmetic imperfections are not important and the