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2010

Generic Requirements for Surface Mount Design and Land Pattern Standard

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A standard developed by IPC

Association Connecting Electronics Industries

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- Focus on end product performance
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Developed by the Surface Mount Land Patterns Subcommittee (1-13)
of the Printed Board Design Committee (1-10) of IPC

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Users of this publication are encouraged to participate in the development of future revisions.

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Generic Requirements for Surface Mount Design and Land Pattern Standard

1 SCOPE

This document provides generic requirements on land pattern geometries used for the surface attachment of electronic components, as well as surface mount design recommendations for achieving the best possible solder joints to the devices assembled.

1.1 Purpose The intent of the information presented herein is to provide the appropriate size, shape and tolerance of surface mount land patterns to insure sufficient area for the appropriate solder fillet to meet the requirements of IPC J-STD-001, and also to allow for inspection, testing, and rework of those solder joints. Designers can use the information contained herein to establish standard land pattern geometries not only for manual designs but also for computer-aided design systems. Whether parts are mounted on one or both sides of the printed board, subjected to wave, reflow, or other type of soldering, the land pattern and part dimensions should be optimized to insure proper solder joint and inspection criteria.

Land patterns become a part of the printed board circuitry and they are subject to the producibility levels and tolerances associated with fabrication and assembly processes. The producibility aspects also pertain to the use of solder mask and the registration required between the solder mask and the conductor patterns.

In addition to the land pattern geometries required for proper solder joint formation, other mounting conditions must be considered, such as solder mask clearance, solder paste stencil aperture sizes, clearance between adjacent components, clearance between the bottom of the component and the printed board surface (if relevant), keep-out areas (if relevant), and suitable rules for adhesive applications. These additional features become part of the overall land pattern standard for each component type.

Note 1: The dimensions used for component descriptions have been extracted from standards listed in Section 2. Designers should refer to the manufacturer's data sheet for specific component package dimensions.

Caution: Users should be aware that individual component data sheets may not meet standardized component outlines (.e.g., JEDEC standard component outlines).

Note 2: Elements of the mounting conditions, particularly the courtyard, given in this standard are related to the reflow soldering process. Adjustments for wave or other soldering processes, if applicable, have to be carried out by the user. This may also be relevant when solder alloys other than eutectic tin lead solders are used.

Note 3: This standard assumes that even under worst case tolerance conditions the opportunity for an acceptable solder fillet will be maintained.

Note 4: Heat dissipation aspects have not been taken into account in this standard. Greater mass may require slower process speed to allow heat transfer.

Note 5: For surface mount components, the solder joints provide not only the electrical connection, but the mechanical support as well. Heavier components (greater weight per land) require larger lands; thus, adding additional land pattern surface will increase surface area of molten solder to enhance capabilities of extra weight. In some cases the lands shown in this standard may not apply for a particular application and may need to be increased in a land pattern library; in these cases, considering additional measures may be necessary.

1.2 Documentation Hierarchy This standard identifies the generic physical design principles involved in the creation of land patterns for surface mount components, and is supplemented by a shareware IPC-7351 Land Pattern Calculator that provides, through the use of a graphical user interface, the individual component dimensions and corresponding land pattern recommendations based upon families of components. The IPC-7351 Land Pattern Calculator is provided on CD-ROM as part of this standard. Updates to land pattern dimensions, including patterns for new component families, can be found on the IPC website (www.ipc.org) under the "Knowledge" menu, within "PCB Tools and Calculators." See Appendix B for more information on the IPC-7351 Land Pattern Calculator.