

Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

Objective:

IPC 1601 specifies comprehensive measures regarding the handling and storage of circuit boards. In addition to the manufacture, storage and transportation of circuit boards, it also covers the requirements for reliable processing at the user's end. These recommendations are intended to provide a basis for discussing the targeted implementation of IPC-1601 for all process participants.

Method:

Description of the challenging requirements of IPC-1601 and proposals for their feasible implementation. If compliance with IPC-1601 is requested, these recommendations shall serve as a supplement to the agreement between the PCB manufacturer and the customer.

Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

IPC section	Requirement	Comment/remark
3.1.1	<ul style="list-style-type: none"> a. Handle PP + resin-coated foils by the edges only and wear gloves at all times b. Reseal opened PP bag c. Store PP + resin-coated foils at < 23 °C and < 50% relative humidity d. Allow PP + resin-coated films to acclimatise if storage temperature is below room temperature e. Process control (storage, place of use, transportation) via temperature and humidity indicators 	<ul style="list-style-type: none"> a. Make sure that the handling method does not adversely affect product quality and functionality b. Only if climate of storage room is not controlled. c. Storage conditions must be agreed and/or validated together with the manufacturer of the material. d. Any existing temperature differences should be taken into account during validation. e. Monitor indoor climate via temperature and RH indicators.
3.1.2	Do not mix different resin types	Ensure material storage is organised accordingly.
3.2.3	Minimise time between baking and lamination (moisture absorption). Remove any moisture prior to packaging/assembly	Any residual moisture that may be present should be evaluated during validation.
3.2.3.2	<p>Determine the degree of moisture of the etched cores according to IPC-TM-650, Test Method 2.6.28.</p> <p>Separate cores on racks and bake at 105 °C for 30 minutes.</p> <p>Baking of stacked cores:</p> <p>Max. height: 25.4 mm</p> <p>Temp. in stack middle: 105 °C-120 °C</p> <p>Bake time: 2 hours</p>	Ensure moisture absorption is kept to a minimum during interim storage.

Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

IPC section	Requirement	Comment/remark
3.2.3.3	Section 3.2.3.2 also applies to sequentially laminated PCBs. Baking: 180 °C for 2 hours or 150 °C for 8 hours or 120 °C for 24 hours	Ensure moisture absorption is kept to a minimum during interim storage.
3.3.2	Wear gloves when handling laminated panels/PCBs	Use suitable measures to prevent fingerprint contamination.
3.3.3	Monitor temperature and humidity levels along all process steps. Baking is recommended prior to plating and solder mask application.	The process parameters should be defined so as to prevent any adverse effects.
3.3.6	Moisture content between 0.1 to 0.5% of resin weight.	Baking of PCBs by manufacturer: -> artificial ageing of the soldering surface -> impairment of solderability/storage time It is recommended that baking takes place just before the soldering process.

Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

IPC section	Requirement	Comment/remark																												
3.4.4	<p>Recommendations for PCB baking profiles</p> <table border="1" data-bbox="362 507 1301 1268"> <thead> <tr> <th data-bbox="362 507 573 593">Final Finish</th> <th data-bbox="573 507 772 593">Temperature</th> <th data-bbox="772 507 893 593">Time [h]</th> <th data-bbox="893 507 1301 593">Comments</th> </tr> </thead> <tbody> <tr> <td data-bbox="362 593 573 715">Tin</td> <td data-bbox="573 593 772 715">105-125 °C</td> <td data-bbox="772 593 893 715">4-6</td> <td data-bbox="893 593 1301 715">Higher temperatures may reduce solderability. See 3.4.1.5</td> </tr> <tr> <td data-bbox="362 715 573 794">Silver</td> <td data-bbox="573 715 772 794">105-125 °C</td> <td data-bbox="772 715 893 794">4-6</td> <td data-bbox="893 715 1301 794">Silver may tarnish. See 3.4.1.4</td> </tr> <tr> <td data-bbox="362 794 573 879">Nickel/Gold</td> <td data-bbox="573 794 772 879">105-125 °C</td> <td data-bbox="772 794 893 879">4-6</td> <td data-bbox="893 794 1301 879">See 3.4.1.2</td> </tr> <tr> <td data-bbox="362 879 573 963">ENEPIG</td> <td data-bbox="573 879 772 963">105-125 °C</td> <td data-bbox="772 879 893 963">4-6</td> <td data-bbox="893 879 1301 963"></td> </tr> <tr> <td data-bbox="362 963 573 1048">Organic coating</td> <td data-bbox="573 963 772 1048"></td> <td data-bbox="772 963 893 1048"></td> <td data-bbox="893 963 1301 1048">See 3.4.1.1</td> </tr> <tr> <td data-bbox="362 1048 573 1268">HASL/HAL</td> <td data-bbox="573 1048 772 1268">105-125 °C</td> <td data-bbox="772 1048 893 1268">4-6</td> <td data-bbox="893 1048 1301 1268">Final surface thicknesses below 0.77 µm (30.0 µin) may form a purely intermetallic layer and impair the solderability of the printed board.</td> </tr> </tbody> </table>	Final Finish	Temperature	Time [h]	Comments	Tin	105-125 °C	4-6	Higher temperatures may reduce solderability. See 3.4.1.5	Silver	105-125 °C	4-6	Silver may tarnish. See 3.4.1.4	Nickel/Gold	105-125 °C	4-6	See 3.4.1.2	ENEPIG	105-125 °C	4-6		Organic coating			See 3.4.1.1	HASL/HAL	105-125 °C	4-6	Final surface thicknesses below 0.77 µm (30.0 µin) may form a purely intermetallic layer and impair the solderability of the printed board.	<p>Individual definition of baking conditions based on type-specific validation by the end user.</p>
Final Finish	Temperature	Time [h]	Comments																											
Tin	105-125 °C	4-6	Higher temperatures may reduce solderability. See 3.4.1.5																											
Silver	105-125 °C	4-6	Silver may tarnish. See 3.4.1.4																											
Nickel/Gold	105-125 °C	4-6	See 3.4.1.2																											
ENEPIG	105-125 °C	4-6																												
Organic coating			See 3.4.1.1																											
HASL/HAL	105-125 °C	4-6	Final surface thicknesses below 0.77 µm (30.0 µin) may form a purely intermetallic layer and impair the solderability of the printed board.																											

Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

IPC section	Requirement	Comment/remark
4.1.1	Bake polyimide materials prior to packaging. Packaging should include: <ul style="list-style-type: none"> - vacuum-sealed moisture barrier bags - humidity indicator cards - desiccants. 	Baking of PCBs by the manufacturer results in: <ul style="list-style-type: none"> -> artificial ageing of the soldering surface -> impairment of solderability/storage time It is recommended that baking takes place just before the assembly.
4.1.2	Include rigid protective backing when packing: <ul style="list-style-type: none"> - thin PCBs (< 1.40 mm) - flexible PCBs - PCBs with complex contours 	Suitable packaging should be selected to avoid mechanical impact.
4.1.5	ESD-compliant packaging material	Packaging material should be agreed between user and supplier. ESD-compliant packaging material for bare PCBs is relevant to pricing.
4.2.1	Water Vapour Transmission Rate for dry packaging: $\leq 0.002 \text{ mg} / 100 \text{ in}^2 / 24 \text{ hrs}$	The choice of packaging material should be agreed between customer and PCB manufacturer.
4.2.2	Use packaging material with a metallic inner layer, especially for lead-free PCBs (moisture).	The choice of packaging material should be agreed between customer and PCB manufacturer.
4.2.3 and 4.2.4	Desiccant materials und humidity indicator cards acc. to IPC-J-STD-033.	Validation to be agreed between customer and supplier.



Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

IPC section	Requirement	Comment/remark
4.2.5	Use of Laminate Witness Coupons to determine the moisture level.	Provision of coupons to be agreed between supplier and customer.
4.3.1.2	Use of sulfur-free and pH-neutral packaging material for Immersion Silver PCBs.	Use a packaging material that does not adversely affect the solderability/ storage time.
4.3.1.3	Full air evacuation (vacuum) is not recommended as this may impair the effectiveness of desiccant.	PCB manufacturers must optimise the degree of vacuuming: <ul style="list-style-type: none"> - to achieve reliable mechanical stability of packaging material - to ensure good performance of desiccant.
4.3.1.4	Place desiccant along the edges of the PCBs inside the moisture barrier bag.	The placement of the desiccant must not: <ul style="list-style-type: none"> - impair solderability - impair performance of desiccant - mechanically impair PCBs. Inclusion of desiccants to be agreed between supplier and customer.
4.3.1.5	Bulk packaging: PCBs $\leq 144 \text{ in}^2 (0.09 \text{ m}^2)$ = 25 boards/package PCBs $> 144 \text{ in}^2 (0.09 \text{ m}^2)$ = 10 boards/package	The number of boards to be grouped per package depends on the PCB size, PCB thickness and circuit design. The supplier should determine a suitable batch size.

Recommendations/comments on “IPC-1601”

(Implementation subject to customer/supplier agreement)

IPC section	Requirement	Comment/remark
4.4.2	Packaging of ESD-sensitive circuit boards should be marked acc. to ANSI, including the ESD protective symbol.  Source: IPC	Labelling to be agreed between customer and PCB manufacturer.
4.4.3	PCBs enclosed in dry packaging should be marked with a suitable warning or moisture sensitivity caution symbol as indicated below.  Source: IPC	Labelling to be agreed between customer and PCB manufacturer.
5.	Goods receipt, storage and assembly of PCBs	Does not apply to manufacturers of bare PCBs.