



# Work Instruction

## SUPPLIER PRINTED CIRCUIT BOARD REQUIREMENTS

| Revision Date | Summary of Change  | Initials |
|---------------|--|----------|
| 09/16/2024    | Add section 3.1.10 requiring supplier to provide a sample panel.   | GK       |
| 01/22/2024    | Edit x-out section 3.5 adding a sub-section for panels arrays that have 2 to 5 boards. Edit and reorganizing the rest of the sub-sections for clarity. | GK       |
| 10/21/2022    | Added section 3.1.7 with soldermask cross link requirement. Add sections 3.1.8 & 3.1.9 for shelf life and packaging requirements.                      | GK       |
| 02/13/15      | Edit sections 3.1.5 by removing sign-off requirement. Removed section 3.8 supplier acceptance signature.   | N/A      |
| 08/28/13      | Edit wording in section 1.0 and 3.7  | N/A      |
| 08/27/13      | Section 3.1.6 was edited to include soldermask manufacturer name and part number requirement   | N/A      |
| 05/29/13      | Instruction section has been corrected to 3.0 and unacceptable breakaway location is now section 3.7   | N/A      |
| 10/25/12      | Added 1.7 to show unacceptable break away locations  | N/A      |
| 08/24/12      | Removed "0.1969" dimension from 3.4.9 and added reference to illustration for spacing dimensions   | N/A      |
| 02/21/12      | Section 3.3.6 was modified removing "NO EXCEPTIONS", 3.1.6 added for soldermask default.   | N/A      |
| 05/05/11      | Sections 3.3.6 was added, 3.4.1 and 3.4.8 have changed dimensional formats, and 3.6.4 - 3.6.8 were removed   | N/A      |
| 02/23/11      | Changed 'panel' to 'lot' section 3.3.3   | N/A      |
| 02/15/11      | Formal Release of this Master Document for Location on the Server  | N/A      |
|               |  |          |



## Work Instruction

# SUPPLIER PRINTED CIRCUIT BOARD REQUIREMENTS

Approved by: **George Kitsis**

1.0 Purpose: To instruct all suppliers that provide Arc-Tronics with printed circuit boards of the requirements that apply to every purchase order that is placed. This also instructs our incoming inspection personnel who enforce these requirements.

2.0 Scope: This instruction only applies to the procurement of printed circuit boards.

3.0 Instruction:

### 3.1. Printed Circuit Board Supplier Requirements

3.1.1. All suppliers of Printed Circuit boards, rigid and flexible shall adhere to the industry standards noted below, as well as requirements detailed in this document.

3.1.2. Any non-compliance without specific prior written approval from Arc-Tronics will be grounds for rejection of material.

3.1.3. All supplier panelized photo-tooling (Gerbers, etc.) must be approved by Arc-Tronics' Production Engineering Department prior to fabrication of any printed circuit boards. Failure to acquire approval prior fabrication will result in the rejection of material at incoming inspection. **No exceptions.**

3.1.4. When drawings are provided to the PCB supplier, the notes on the drawing(s) are to be carefully reviewed. Any discrepancies between the notes in those drawings and any other documentation, either provided or referred to in this specification, is to be brought to the attention of Arc-Tronics' Production Engineering Department for resolution and approval. Failure to adhere to drawing notes requirements will be grounds for rejection of material.

3.1.5. Acceptance of the terms and conditions set forth in this document, and its referenced documents, are requirements of doing business with Arc-Tronics, Inc.

3.1.6. Soldermask is to be dark green matte finish, unless noted otherwise in supplied documentation. In the material section of the Certificate of Compliance, the manufacturer name and part number of the soldermask used must accompany every lot.

3.1.7. Solder mask must be fully cross linked via UV light curing process.

3.1.8. Shelf-Life - Products that callout immersion silver, immersion tin or OSP solder finishes shall be delivered with the latest expiry date as possible and have a minimum of 75% of the shelf-life remaining.



## Work Instruction

# SUPPLIER PRINTED CIRCUIT BOARD REQUIREMENTS

- 3.1.9. All printed circuit boards shall be packaged in vacuum sealed bags, contain humidity indicator cards and at least one desiccant pack.
- 3.1.10. Sample panel shall be provided if any of the following conditions occur:
  - 3.1.10.1.1. First time product is manufactured for production.
  - 3.1.10.1.2. A change in the design affecting fit, form, function and/or interchangeability of the part.
  - 3.1.10.1.3. A significant change in manufacturing processes.
  - 3.1.10.1.4. A change in manufacturing location.
  - 3.1.10.1.5. NOTE: It is not required that the PCB panel be functional, however it must be physically correct (including all internal layers, finished plating, drills, routes, fiducials, etc.)

### 3.2. Applicable Industry Standards

- 3.2.1. Reference Documents – Unless otherwise indicated, the latest released revision of each document shall be used.
  - 3.2.1.1. IPC-6011 Generic performance specification for printed boards
  - 3.2.1.2. IPC-6012 Qualification & performance specification for Rigid printed boards
  - 3.2.1.3. IPC-6016 Qualification & performance specification for high density interconnect
  - 3.2.1.4. IPC-9252 Guidelines and requirements for electrical testing for unpopulated PCB's.
  - 3.2.1.5. IPC-A-600 Acceptability of Printed Circuits
  - 3.2.1.6. IPC-TM-650 Test Methods Manual
  - 3.2.1.7. IPC-SM-840 Acceptability of Solder mask
  - 3.2.1.8. J-STD-003 Solderability Tests for Printed Boards

### 3.3. First Article Documentation Requirements

- 3.3.1. Supplier is to provide a Dimensional first article – for first time run products and for any revision changes, which addresses all notes, specifications and material/ink requirements along with the dimensions. The supplied first article report will address all measurements and print notes including any specifications noted. Any dimensional discrepancies must be clearly noted in the report. If there is a discrepancy the PCB supplier must notify Arc-Tronics Purchasing and Quality for resolution. Arc-Tronics will seek a print change/deviation or written authorization from Arc-Tronics' customer prior to approving any deviation as acceptable.



## Work Instruction

# SUPPLIER PRINTED CIRCUIT BOARD REQUIREMENTS

- 3.3.2. Supplier must provide a Certificate of Compliance that addresses material, plating, ounces, or any special requirements noted on the print with each shipment. This report must include the specific data for each requirement identified in notes on the print, or items identified in this document.
- 3.3.3. Ionic Contamination acceptance to IPC-TM -650 – Test data for each lot to be included with each shipment.
- 3.3.4. Tape test to be performed as per IPC test method for solder mask adherence, the results to be included with each shipment.
- 3.3.5. Electrical Test report – Supplier is to provide the test yields from each run, to run, the kinds of problems that were found, how many out of the run did not pass electrical test. The results to be included with each shipment.
- 3.3.6. **All electrically tested individual PCBs shall be marked with a “T”, or “ET” in indelible ink that will resist board cleaning system chemistries, unless noted otherwise in special instructions on purchase order.**
- 3.3.7. Solderability report – Supplier must provide the results of the float test or test slug with each shipment. X outs can be used for this.
- 3.3.8. No process changes can be made without notifying Arc-Tronics. If there are any changes to ink, plating baths, chemicals, drilling, routing etc., Arc-Tronics must be notified in advance of fabricating parts. Arc-Tronics maintains the option of acceptance when process changes are identified.
- 3.3.9. Supplier must provide a Certificate of Compliance from their raw board laminate supplier that includes the materials, thicknesses, etc. applicable to the laminate specification requirements as evidence that the raw laminate material was used to fabricate each lot shipped.

### 3.4. PCB Panel and Board Layout Requirements

- 3.4.1. Minimum panel size is 2.5 x 2.5 in<sup>2</sup> (50 x 50 mm<sup>2</sup>) maximum panel size is 18”x 18”
- 3.4.2. (457 x 457mm<sup>2</sup>). Please contact Arc-Tronics, Inc. for panel dimensions beyond 18”x 18”.
- 3.4.3. Preferred Panel Sizes for FR4 type material:
- 3.4.4. .031” thick PCB’s should be kept to 6”x 6” or under.
- 3.4.5. .062-.093 thick PCB’s should be kept to 10”x 10” or under.
- 3.4.6. Best utilization of the panel material should always be taken into consideration during panel layout along with the quantity and density of large heavy items to be placed on the panel during the production process. (If component weight information is available, it will be supplied to the PCB manufacture at time of order)

# SUPPLIER PRINTED CIRCUIT BOARD REQUIREMENTS

- 3.4.7. Two opposing PCB handling edges (conveying edges) shall have a minimum of 3mm free of components from the outer edge of the board for conveyor handling. These opposing edges should be straight, continuous and parallel to one another.
- 3.4.8. All boards/panels will require six (6 qty.) 1mm dia. (0.0394" dia) solid copper circular fiducials, three (3 qty.) on the component side, and three (3 qty.) on the solder side of the PCB. All fiducials shall have a 1mm clearance from any other copper traces, legend features, stamps and solder mask. The fiducials should be located 0.3750"x 0.1600" from the corners of the board/panel on the breakaways. If tooling holes are not required then the fiducials may be located 0.1600"x0.1600" from the corners.
- 3.4.9. Qty. 4, 0.125 diameter non-plated thru tooling holes should be located in each corner of the panel as shown in the illustration below. This is a requirement for automated Thru-Hole insertion.

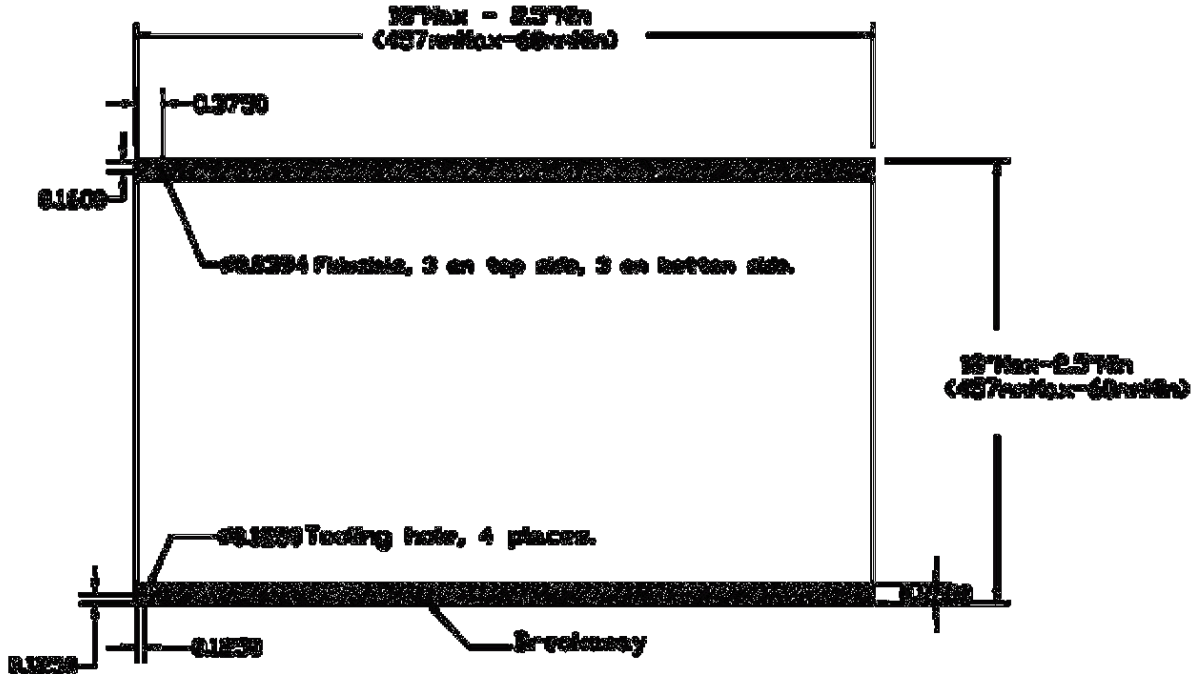
### 3.5. X-Outs

- 3.5.1. Arc-Tronics has agreed to allow x-outs. The following conditions apply to the specific part numbers that x-outs would be acceptable.
- 3.5.1.1. X-outs on a panel array that contains 2 to 5 parts are not allowed without justification and Arc-Tronics approval.
  - 3.5.1.2. One out of every six parts on a panel may be an x-out.
  - 3.5.1.3. Panels with X-outs may not exceed 10% of the total panels on any lot.
  - 3.5.1.4. Each defective part in the panel is to be marked on both sides in an indelible ink.
  - 3.5.1.5. All panels containing x-outs shall be packaged separately. Panels that have an X-out in the same position shall be packaged separately.

### 3.6. Array and Panel Configurations

- 3.6.1. A 0.250" wide, scored breakaway must always be added on the long edges as shown below. When specified, a 0.250" scored breakaway rail around the entire perimeter of each panel is required.

## SUPPLIER PRINTED CIRCUIT BOARD REQUIREMENTS



### 3.7. Routed Panel Break Away Patterns

3.7.1. Break away patterns shall not be placed next to holes in the PCB piece part or adjacent to any small web of board material that creates a potential to damage the PCB piece part during de-panelization. An example of an unacceptable condition is shown below:

