 <b>SECHAN</b> <b>ELECTRONICS</b> <i>Performance every time.</i>	<b>PRINTED BOARD MANUFACTURING SPECIFICATION</b>		
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## PRINTED BOARD MANUFACTURING SPECIFICATION

REV. HISTORY	DATE	DESCRIPTION	RELEASE AUTHORIZED BY
K	04/22/20	Reviewed and updated document. Removed QAIS references. Updated header titles. Added 90.TR.200, IPC-4562, and updated IPC-SM-840 title in Applicable Documents and Forms. Removed Panel Tool Holes and PWB Scoring from Terms and Definitions. Added Personnel Training, Safety, and Records sections.	AS
L	07/06/20	Reviewed and updated document per 90.MG.200. Changed PIC-4562 to IPC-4562 under Applicable Documents and Forms. Added PO, PWB, and SMT under Terms and Definitions.	SK
M	03/22/23	Removal of QR-6 under section 4.1 as visitation is part of Sechan’s Terms and Conditions, 90.MA.200-1.	SO

### PURPOSE

- To provide general procurement requirements between Sechan Electronics, Inc. (BUYER) and SELLER for Types 2, 3, or 4 printed board technologies.
- To establish a Class 3 (High Reliability Electronic Products) product performance standard that is consistent with the IPC workmanship standards (IPC-A-600, IPC-6011, IPC-6012, and IPC-6013).

### SCOPE

All applicable printed wiring boards purchased for deliverable products shall conform to this procedure.

### RESPONSIBILITY

The QA Department is responsible for maintaining and enforcing this procedure. Suggested corrections and clarifications shall be identified to the QA Department Office.

### APPLICABLE DOCUMENTS AND FORMS

*\*Note: Document Titles are for reference only and are subject to change.*


The following documents of the revision at time of this release form a part of this supplement to the extent specified herein. Revision applicable at date of BUYER order applies. Other applicable detail product drawings, specifications and requirements will be listed on the face of the BUYER order.

90.TR.200	OJT Planning and Implementation
IPC-1601	Printed Board Handling and Storage Guidelines
IPC-2221	Generic Standard on Printed Board Design

IPC-2222	Sectional Design Standard for Rigid Organic Printed Boards
IPC-4101	Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-4103	Specification for Base Materials for High Speed/High Frequency Applications
IPC-4202	Flexible Base Dielectrics for Use in Flexible Printed Circuitry
IPC-4553	Specification for Immersion Silver Plating for Printed Boards
IPC-4562	Metal Foil for Printed Board Applications
IPC-6011	Generic Performance Specification for Printed Boards
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards
IPC-6013	Qualification and Performance Specification for Flexible Printed Boards
IPC-A-600	Acceptability of Printed Boards
IPC-SM-840	Qualification and Performance of Permanent Polymer Coating (Solder Mask) for Printed Boards
IPC-TM-650	Test Methods Manual
J-STD-003	Solderability Tests for Printed Boards

**TERMS AND DEFINITIONS**

CTE	Coefficient Temperature Expansion
IPC Class 3	High Performance Electronic Products. Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be harsh, and the equipment must function when required, such as life support or other critical systems.
PTH	Plated Through Hole
PO	Purchase Order
PWB	Printed Wiring Board
PWB Panel	Multiple printed boards fabricated on a PWB panel for assembly ease. Layout configuration on the panel is optional but must be documented to BUYER.
SMT	Surface Mount Technology
T <sub>g</sub>	Glass Transition Temperature
Type 2 (PWB)	Double-sided printed board
Type 3 (PWB)	Multilayer printed board without blind and/or buried vias

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Type 4 (PWB)	Multilayer printed board with blind and/or buried vias
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**PERSONNEL TRAINING**

Training for this procedure shall be performed per 90.TR.200.

**SAFETY**

Not Applicable.

**RECORDS**

Not Applicable.

**PROCEDURES**

**ORDER OF PRECEDENCE**

In the event of differences and/or conflict among different requirements, the following order of precedence shall apply:

- The BUYER procurement order
- The master drawing or assembly drawing
- This order supplement
- Other applicable documents

Conflicts and planned resolution shall, however, be identified to the BUYER in writing (e-mail is preferred). To assure consistency in material provided, the BUYER may initiate a revision in the printed board master drawing and incorporate this change in the order structure.

**1.0 GENERAL REQUIREMENTS**

It is the intent that processes be consistent with normal SELLER operations and practices to the extent possible. However, material selection and process control requirements of this supplement shall be implemented unless a variance is authorized by the BUYER.

**1.1 MATERIALS**

The timely identification of material selection variances is valued and encouraged. Disposition of these variances shall be documented with mutual concurrence between BUYER and SELLER and shall become part of the printed board configuration baseline.

- It is recognized that drawing requirements (customer and otherwise) may not always specify some materials or that materials specified may be incompatible. Because of this, it is required that the SELLER review materials selected for this printed board fabrication and that these materials be compatible and consistent with IPC-2222 par. 4 with regard to temperature characteristics (CTE and T<sub>g</sub>). Laminates selected shall have glass transition temperatures (T<sub>g</sub>) typically 170°C or higher.
- The Pre-impregnated Bonding Layer (Prepreg) shall conform to the types and requirements listed in IPC-4101 and shall be compatible with copper clad laminate, as applicable.
- Adhesives selected shall be compatible and consistent with IPC-2221 par. 4.2.2 and 4.2.3, and

IPC-4101, as applicable.

- Laminate materials shall be selected from material listed in IPC-4101, IPC-4103 or IPC-4202, as applicable.
- Conductive materials used in the printed board construction shall be in accordance with IPC-2221 par. 4.4 and Table 4-3 for IPC Class 3 product. Conductive materials and printed board exterior finish shall be as required by master drawings and shall be compatible with other materials used in printed board construction.
- Non-conductive via fill on blind and buried vias shall be used unless specified on the print.
- Solder mask coatings and markings shall be compatible with each other and other materials in the printed board and shall be in accordance with IPC-SM-840, Class 3. Masking coverage must be uniform and complete, semi-gloss Green is preferred.
- Silkscreen marking shall be in white ink per A-A-56032, Type II using uppercase characters of matching height.
- It is preferred that when the printed board has via holes, these through 'via' holes are tented with solder mask material unless otherwise directed in the board fabrication files.
- Foil wrapping in accordance with IPC-4562 is permissible if the stack-up is not defined in the drawing package.

## **1.2 MECHANICAL/PHYSICAL PROPERTIES**

- The bow and twist of finished bare printed board product shall not exceed IPC-2221 par. 5.2.4 requirements for Class 3 product. Values are measured consistent with requirements of IPC-TM-650 Method 2.4.22.
- If required by PO, printed board panelization shall be as required by IPC-2222 and this BUYER order supplement.
  - a. PTH printed board (or combined SMT / PTH technology) panel shall not be larger than 16" x 16" and shall include a minimum border of 0.4" on at least two parallel sides. The ideal size for Sechan is 15" x 11" and all designs shall be evaluated to fit on this size prior to increasing to the maximum.
  - b. SMT printed board panel shall not be larger than 16" x 18" and shall include a minimum border of 0.4" on the 16" panel dimension.
  - c. Refer to Figure 1 for a typical printed board panelization layout.
  - d. Routed width between printed board and panel shall be 0.100" +/- .005".
  - e. Panel tooling holes are required at three locations. Panel tooling holes shall be 0.125" +.003" / -.000".
  - f. Fiducials are to be placed on the tooling tabs near the three mounting holes.
  - g. Panel breakaway tabs shall use either (a) single side score or (b) double side score. All other tab breakaway conventions require BUYER approval before use. Refer to Figure 2.
  - h. BUYER requires electronic media with revisions (as needed) of the selected panelization layout. This layout configuration media shall be provided as early as practical and will become the basis for panelized PWB acceptance. Submit media per requirements of SDRLO1.

- i. When panelized printed boards are authorized, the Supplier may deliver panels with defective printed boards provided (1) total defective printed boards on each individual panel does NOT exceed one and (2) the shipping lot does NOT contain more than 3% total 'X-Out' printed boards. Defective printed boards MUST be clearly identified and grouped in the shipping lot.

**1.3 PRINTED BOARD WORKMANSHIP**

Printed board workmanship (both external and internal observable characteristics) shall be consistent with IPC Class 3 product performance standards (IPC-A-600, IPC-6011, IPC-6012, and IPC-6013). This criterion will be used as part of the BUYER acceptance process.

**1.4 TECHNICAL DATA PACKAGE**

Sechan shall be provided a written copy, in the SELLER’s format, of any changes to the fabrication data needed to support manufacturing. Unless authorized in writing by the BUYER, the SELLER shall NOT proceed with any changes until formal approval is provided by the BUYER. If BUYER determines that the changes result in a significant contradiction, the BUYER shall provide the SELLER with additional change paper accepting or rejecting the change(s).

See paragraph 5.0 herein for additional guidance.

**FIGURE 1, TYPICAL PANELIZED LAYOUT**

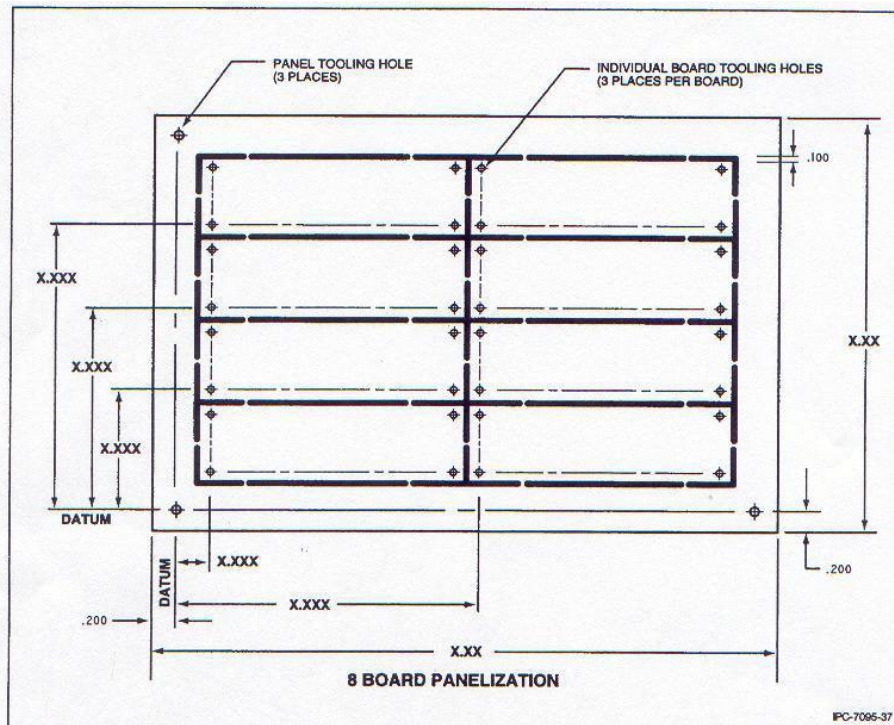
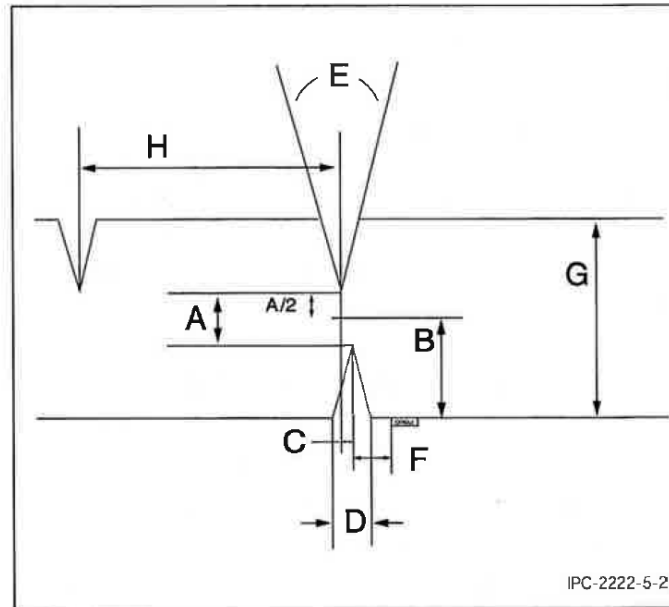


FIGURE 2, BREAKAWAY TAB DETAIL



Detail Letter	Title	Definition	Attainable Tolerances
A	Web	The material remaining between the two (2) 'V' scores on a plane perpendicular to the printed board surface	$\pm 80 \mu\text{m}$
B	Centrality	The distance the center of a web is offset from true center within the printed board.	$\pm 80 \mu\text{m}$
C	Blade offset	The distance the top and bottom scoring blades are offset from one another.	$\pm 80 \mu\text{m}$
D	Score width	The width of a score line at the surface of the printed board	$\pm 80 \mu\text{m}$
E	Cutter angle	The total angle of a scoring blade.	$\pm 2^\circ$
F	Keep out area	The area, expressed from nominal score line placement, that no features should be placed within.	$D/2 + \text{All registration}$
G	Printed board thickness	Overall printed board thickness to be scored.	Per IPC standards
H	Trueness/ Position	The tolerance of two or more score lines on one side of the printed board. Measured from nominal, squareness and actual position.	$\pm 80 \mu\text{m}$ cumulative

## 2.0 PRODUCT MARKING AND SERIALIZATION

Each printed board shall be identified and traceable to the SELLER fabrication lot in accordance with IPC-2221 and shall include:

- Printed board part number and revision
- Traceability identification
- Production lot date code
- Manufacturer's identification

**3.0 PACKING/PACKAGING/LABELING AND SHIPMENT**

SELLER selected packing and packaging shall be suitable for the intended purpose, providing proper protection for the printed board using IPC-1601, paragraph 4 as guidance.

**3.1 SILVER IMMERSION FINISH**

SELLER shall package per IPC-4553, Section 3.8. Boards shall be individually packaged immediately after processing. Air shall be vacated from the individually packaged board. Interleave may be used only if it is certain not to react with the silver finish. Desiccant and other silver reactive materials shall not be used.

**3.2 ALL OTHER FINISHES**

Additionally, each PWB shall be packaged with interleaving material such that the PWB is not in direct contact with an adjacent PWB. The packaging material selected shall not leave residual material on the PWB surface.

**4.0 QUALITY ASSURANCE**

**4.1 BUYER STANDARD QUALITY REQUIREMENTS**

The following BUYER Standard Quality Requirements apply. QR clause language may be found on the BUYER website at [www.sechan.com](http://www.sechan.com). On the home page, click on the ‘Suppliers’ tab and then select ‘Quality Requirements’ to download the QR Clauses.

QR-2	Supplier Quality System
QR-3	General Purchase Order C of C
QR-3.2	Quality Record Retention
QR-3.3	Raw Material Certification
QR-4	Supplier’s Corrective Action System
QR-5	Supplier Configuration Control
QR-7	Nonconforming Material Disposition
QR-15	Acceptance Test Reports
QR-25	First Article Inspection Report
QR-32	Printed Board Fabrication

**4.2 PRINTED BOARD ELECTRICAL TEST DATA**

**4.2.1**

Each printed board delivered shall be electrically tested for proper continuity per IPC-A-600, section 5.2, using the BUYER provided documentation (Gerber or CAD extracted netlist or equivalent). This testing includes both continuity and internal short testing. Certification to this requirement is required for each deliverable; a physical product stamp (or mark) on the printed board is preferred. Submit test certification per SDRL02.

#### 4.2.2

Supplier shall provide a copy of the netlist, or equivalent, used to perform the test that includes the pass/fail values, for reference the first time a board part number is delivered to Sechan.

#### 4.3 MATERIAL CONFORMANCE CERTIFICATION

Each printed board lot delivered shall include material certifications for materials used in PWB fabrication process (refer to paragraph 4.1 above) and QR-3.3. As a minimum, these certifications shall include:

- SELLER and SELLER's batch lot identification
- Laminate manufacturer's certification
- Prepreg manufacturer's certification
- Adhesive manufacturer's certification
- Other material certifications, *if specified in the master drawings*
- Submit material certifications per SDRL02

#### 4.4 PROBLEM INVESTIGATION REPORT

Printed board failures returned to SELLER shall be analyzed for root-cause and corrective action. A Problem Investigation Report (PIR) shall be issued to the BUYER in accordance with SDRL03.

#### 4.5 J-STD-003 CATEGORY 3

When Category 3 testing is required by contract (PO, drawing, etc.). The SELLER shall provide a report certifying compliance to the requirement for each delivery.

#### 4.6 COUPONS

In addition to the IPC-2221 A coupon, Supplier shall generate a B coupon (with input from Sechan as required) in order to characterize and evaluate each blind, buried or filled through hole via. The B coupon is to be designed for registration evaluation. Its construction should insure that both minimum annular ring and minimum spacing between plated holes and circuitry are met. The B coupon shall have a land size that makes this possible, even if that size pad with that particular drilled hole diameter does not exist on the part.

#### 4.7 SUPPLIER DATA REQUIREMENTS LIST (SDRLs)


Attachment I presents the required requirements by this procedure.

#### 5.0 SELLER GUIDELINES FOR PROCESS FLEXIBILITY

There are certain aspects of PWB fabrication that may be determined by the SELLER without BUYER approval. The following provides guidelines for the specific items, categories that the SELLER may proceed without BUYER concurrence or approval. All other items must be in accordance with 1.4 herein.

- a. Etch Compensation – The Supplier is permitted to increase the sizes of copper features to allow for the etch process to etch down to the target feature size and spacing.
- b. Silkscreen Clipping – The Supplier is permitted to clip any silkscreen marking to avoid ink getting onto solderable pads or into holes.



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## ATTACHMENT I SUPPLIER DATA REQUIREMENTS LIST

The following documentation is required. Reports may be submitted in SELLER format; unless otherwise specified, only one (1) copy of each submission is required. All technical data submitted shall be identified with the BUYER order and with the name and address of the SELLER.

ITEM	FREQUENCY	DESCRIPTION
SDRL01	Once w/revisions	Electronic media of the selected panelization layout shall be provided. Provide this layout media as early as practical.
SDRL02	Each deliverable lot	LOT ACCEPTANCE DATA including (a) material conformance certifications.
SDRL03	As Required	PROBLEM INVESTIGATION REPORT – Submitted as required.