



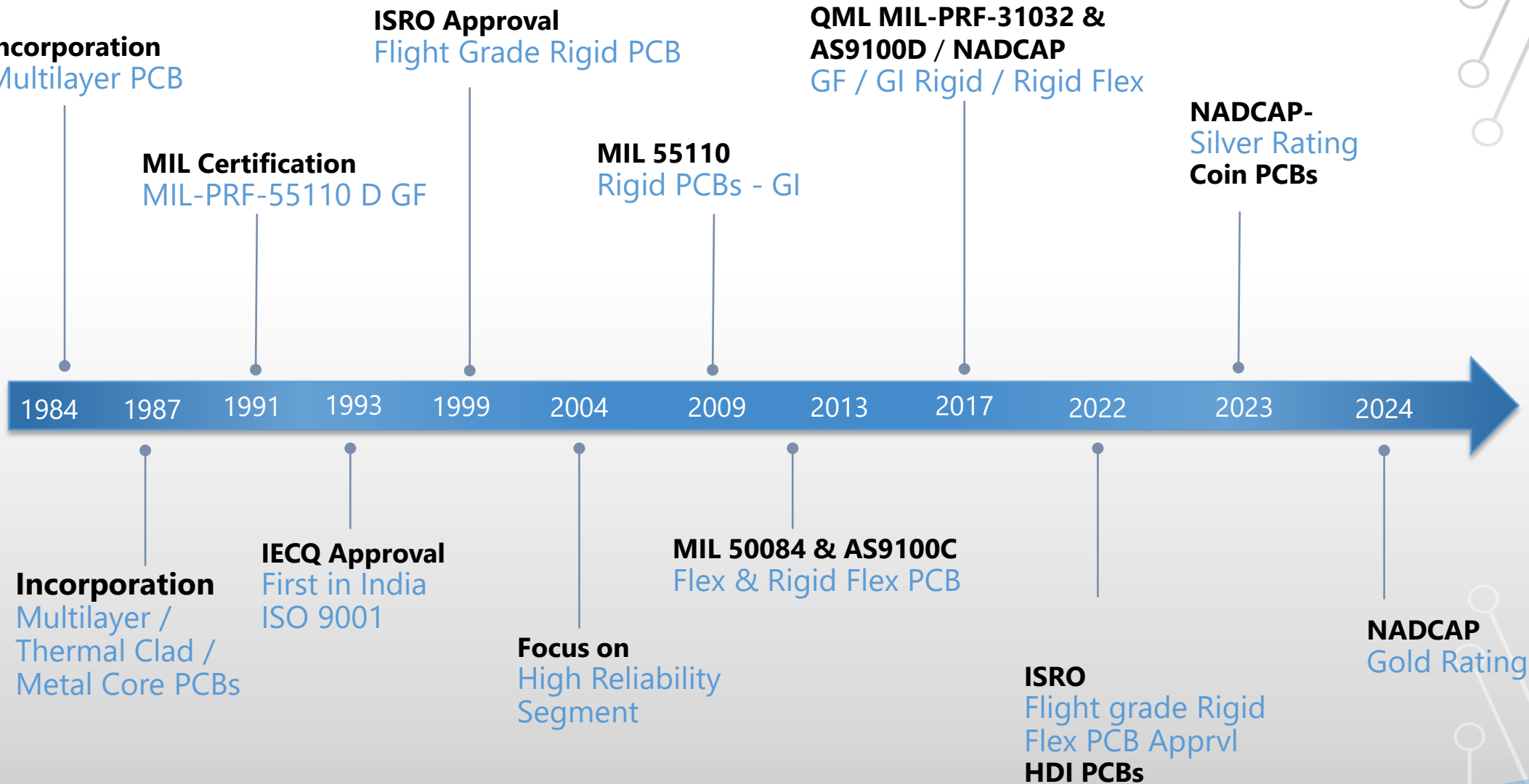
mp | Welcome to
Micropack Pvt Ltd

PCBs for High Reliability Applications



Micropack Private Limited

History : 40 Years Legacy



Approvals & Certifications



Aerospace Approvals

- Honeywell Aerospace USA
- Thales France
- Safran France
- SAAB France
- Collins Aerospace USA



Israel Aerospace Industries (IAI)

Bharat Electronics Limited

CERN Geneva



AS9100D 2015 Certification. 1st in India



ISO 14001-2015 Certification

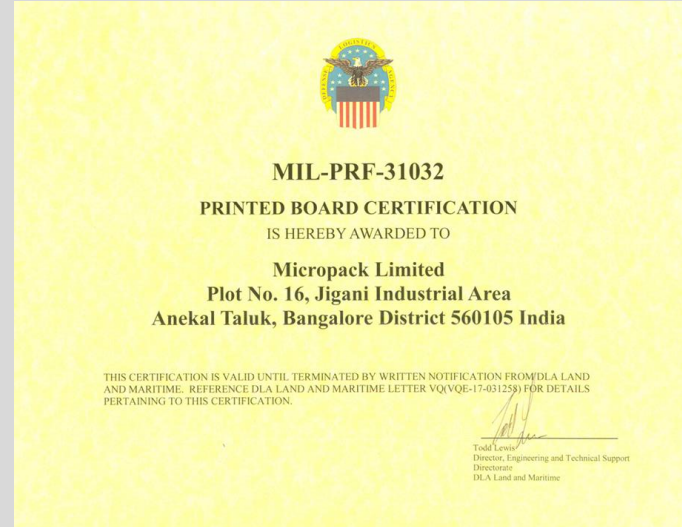


UL-USA and Canadian safety approvals as per 94-V0 and 786 standards : File # E95743 (for Rigid PCBs)



LCSO /JSS – India Defence approval for multilayer PCBs a

Micropack has the approval from Major Defense & Aerospace Equipment Manufacturers in India & Global



The certification scope cover all PCB technologies.

DRDO / DRDL / DRLR
Defense Research & Development Organization



HAL
Hindustan Aeronautical Limited



ISRO
Indian Space Research Organization



NPCIL
Nuclear Power Corporation of India



Space

Defense and Aerospace

Industrial and Others

mp



THALES

Honeywell Aerospace



Collins Aerospace



सी-डॉट C-DOT



Astra Microwave Products Limited On A Winning Wavelength

HCL



TEJAS NETWORKS



SFO TECHNOLOGIES A NeST Group Company CREATING INNOVATIVE SOLUTIONS

CoreEL Technologies



DATA PATTERNS



TATA ADVANCED SYSTEMS



TESSOLVE



INNOVATING WITH QUALITY AND VALUE, FOREVER



Centum Electronics Limited

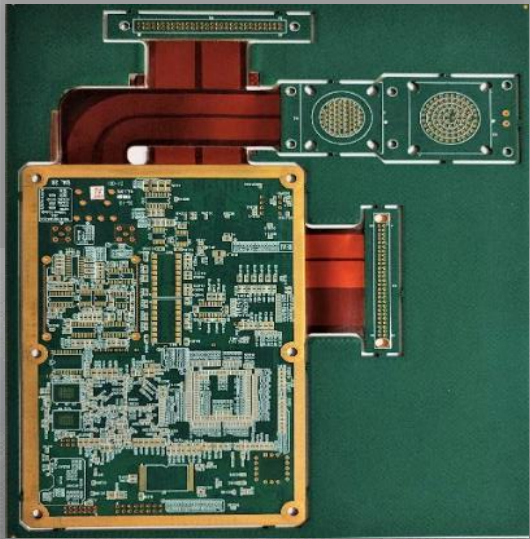


AMETEK

Micropack's association :

- **GEM** (Gas Electron Multiplier) Detectors → **CBM** Program and associated with VECC (1st Station) & front end electronics for 1st station. We have TOT for **GEM** foils.
- GEM foils for **CMS** project through Delhi University.
- Supplying DRIFT & READOUT PCBs (for GE1-1 & GE2-1)
- Worked with NISER for **ALICE** project.
- Contract signed with **CERN** for **ATLAS** and expecting orders.
- **Serenity** (High Speed Digital PCBs) for CMS program through TIFR.
- **HEXA & Half-Hexa** to **CERN**.
- **IPMC** for CMS.

Manufacturing Capabilities



1



Rigid – 42 Layers (max layer count fabricated)

2



Rigid Flex – 26 Layers (max layer count fabricated)

3



HDI (2+N+2) – 30 Layers

4



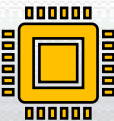
Min. trace width /spacing 0.075mm (3 mil) / 0.075mm (3 mil)

5



Min. finished diameter 0.15mm (6 mil) with mechanical drilling /
0.075mm (3 mil with laser drilling for blind vias)

6



Aspect Ratio 12:1 and **Max. thickness 6mm +/- 10%**
Impedance tolerance +/- 10%

7



**Max. production panel size 450mm x 700mm (MLB) /
1200mm x 610mm (D/S)**

Product Range

Capability to Manufacture

Special Conduction cooled PCBs for heat sinking Metal Core PCBs (Al, Cu, CIC) / Thermal clad PCBs (with both Al+Cu) / Copper Coin / IMS

HDI PCBs with Sequential lamination cycles

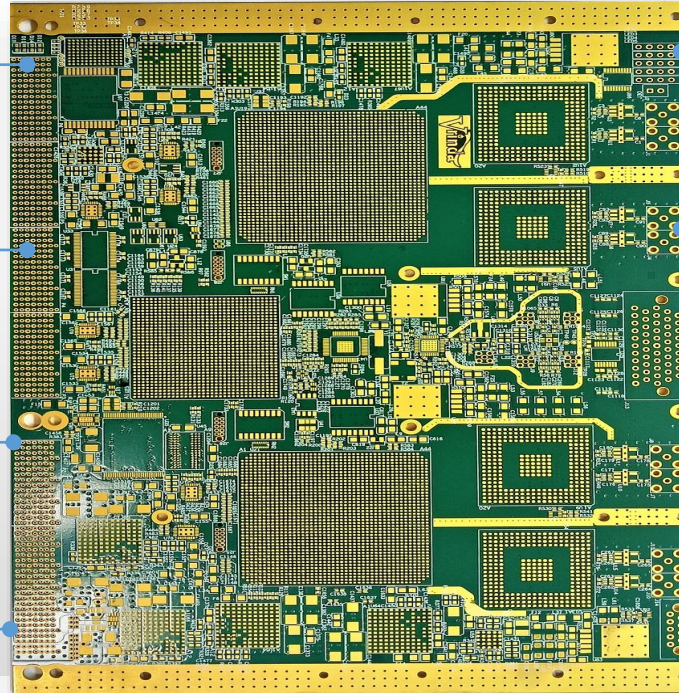
with microvias, blind and buried via

Control Impedance PCBs

10%

RT Duroid / Teflon PCBs

For RF & Microwave



Hybrid PCBs

FR4 + Hydrocarbon ceramic / FR4 + Teflon

Non-Conductive Via filled PCBs with cap plating

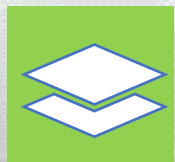
IPC4761 Type VI & VII

Planar Transformer PCBs / High Copper Rigid PCBs

up to 10 Oz copper

Multilevel Flexible PCBs in Polyimide / Polyester

Embedded Resistor panels



Multilayer PCB

Rigid – 42 Layers

Rigid Flex – 26 Layers

HDI (2+N+2) – 30 Layers



Integrated with the global value chains

PCB key Material from Global Supply chain Germany, Taiwan, UK, China, Singapore

Via Type:

Mechanically drilled blind via. Via filled using Non-conductive epoxy ink and Cap plated.

Capability:

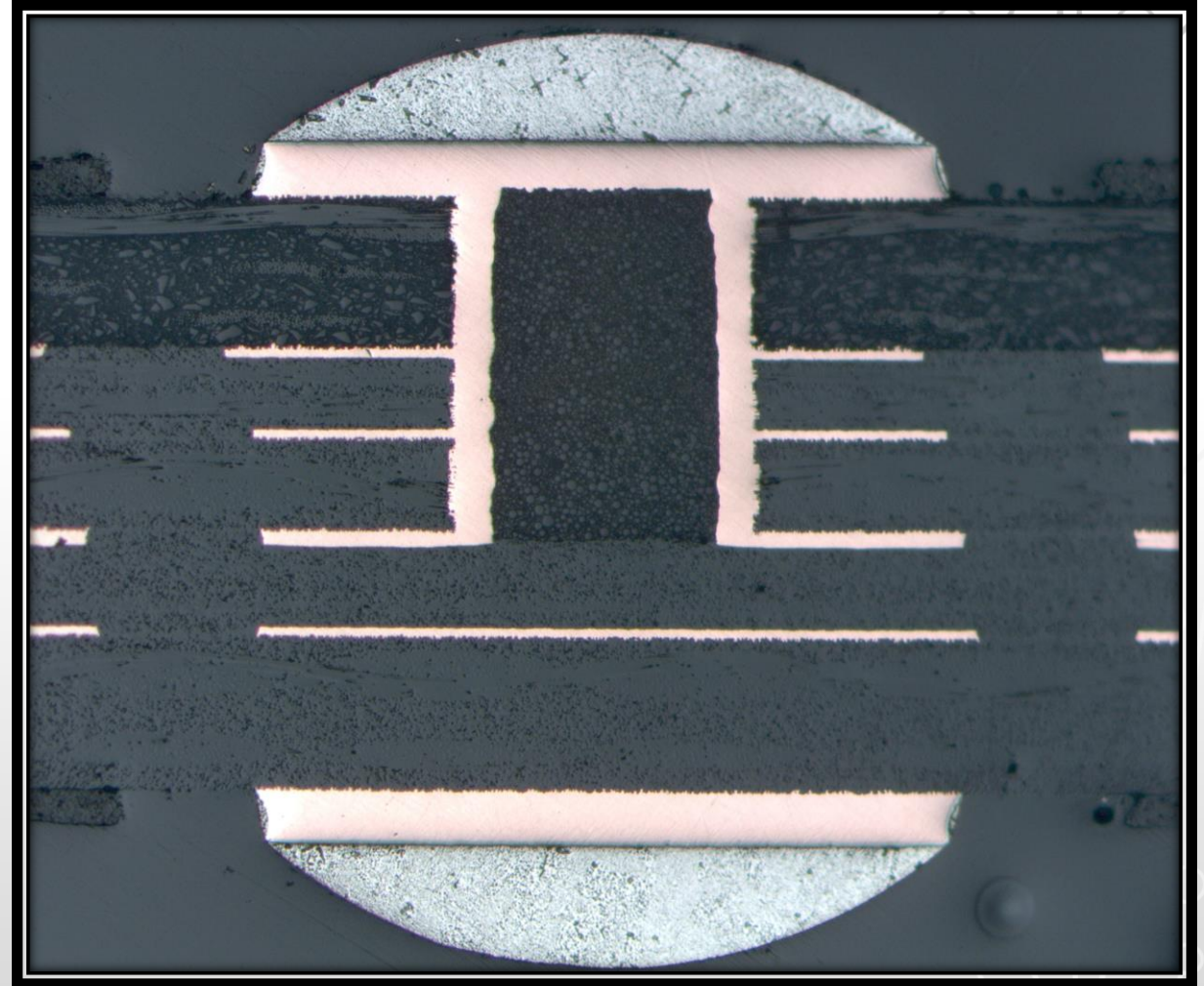
Minimum Drill Diameter :

0.15mm for PCB thickness upto 1.6mm

0.20mm for PCB thickness upto 2.0mm

0.25mm for PCB thickness upto 3.0mm

Maximum Aspect Ratio: 12:1



Via Type:

Mechanically drilled buried via. Via filled using Non-conductive epoxy ink.

Capability:

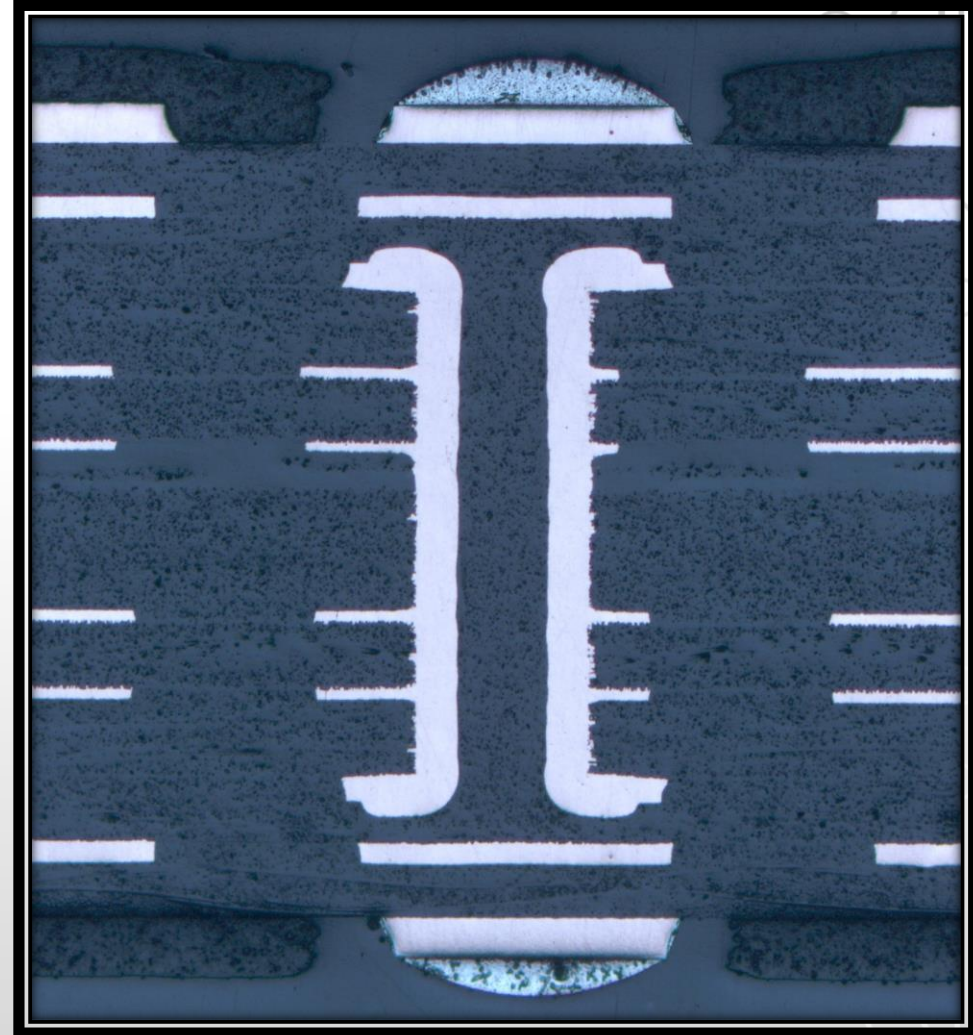
Minimum Drill Diameter :

0.15mm for PCB thickness upto 1.6mm

0.20mm for PCB thickness upto 2.0mm

0.25mm for PCB thickness upto 3.0mm

Maximum Aspect Ratio: 12:1



Via Type:

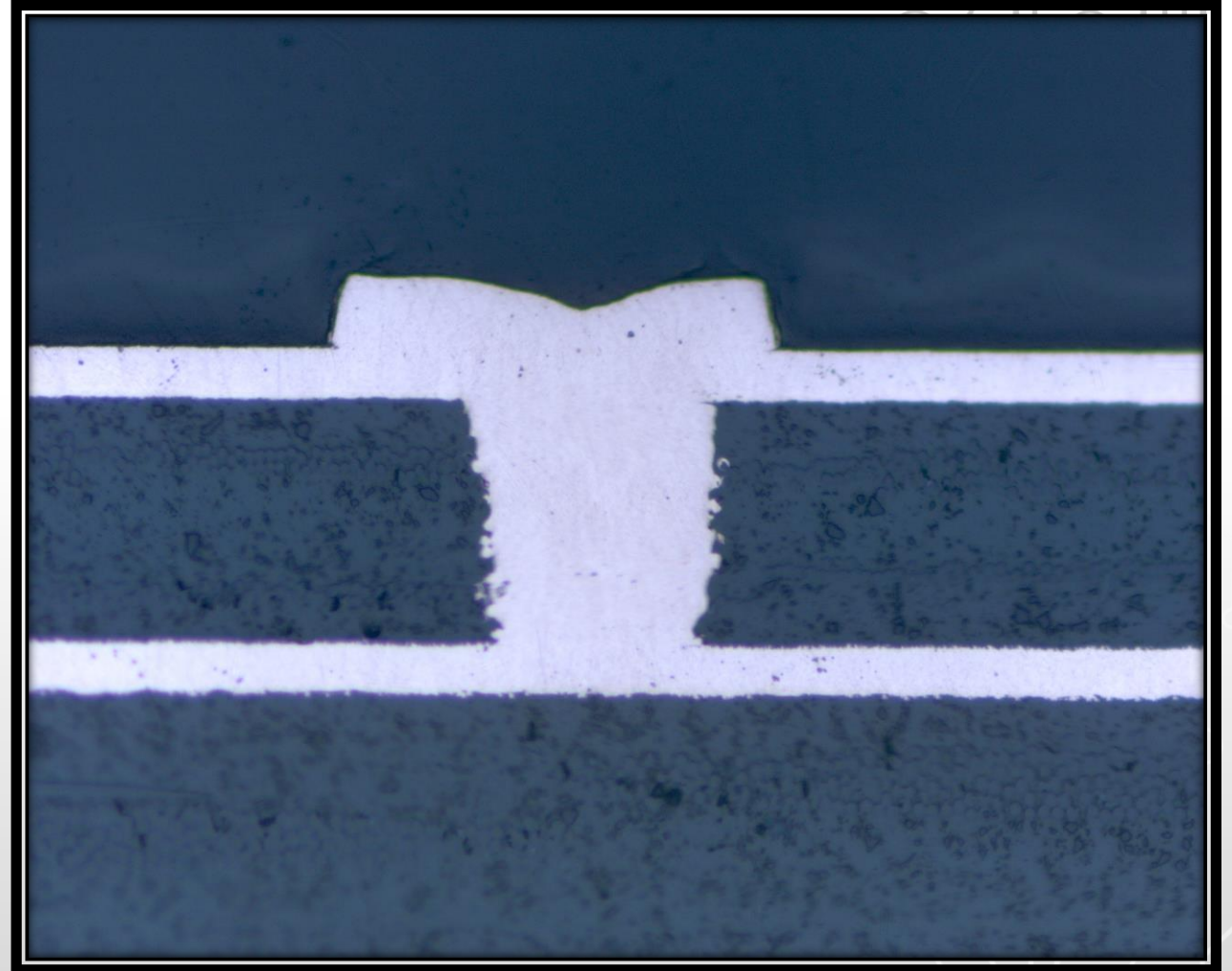
Laser drilled microvia. Via filled with electrolytic copper.

Capability:

Minimum Drill Diameter : 0.10mm

Maximum Drill Diameter: 0.15mm

Maximum Aspect Ratio: 1:1



Via Type:

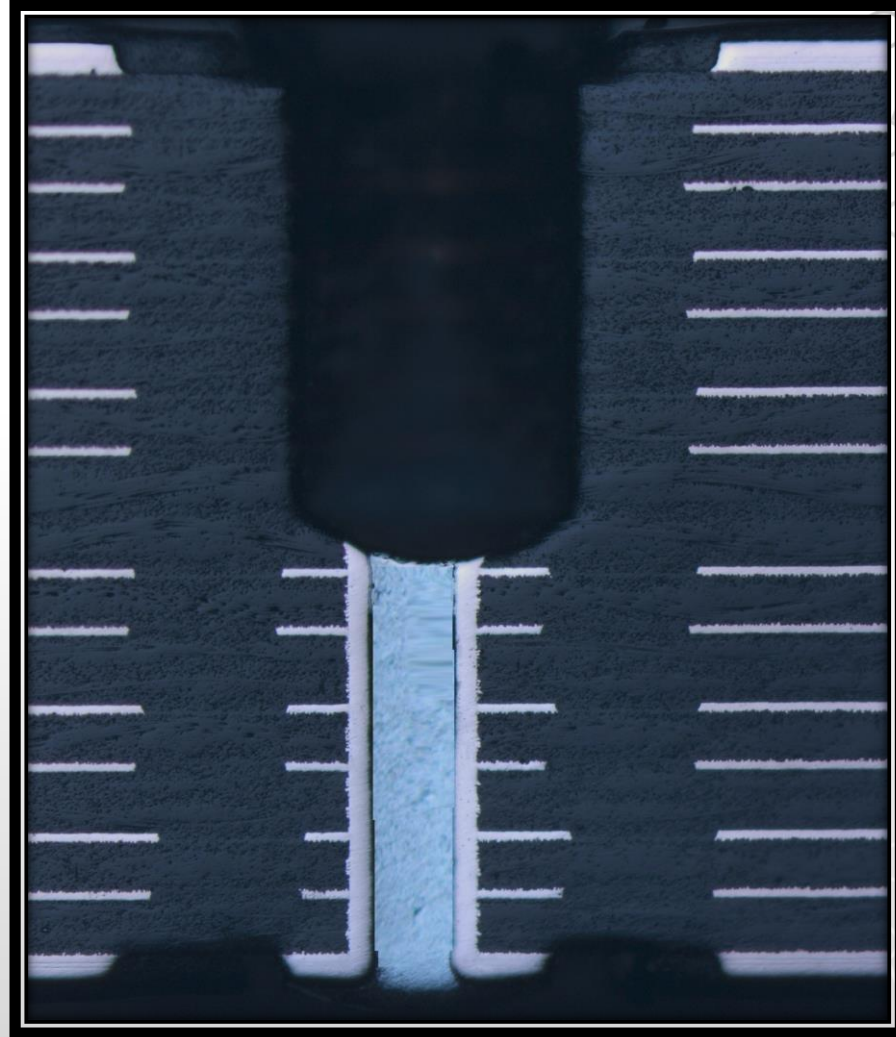
Mechanically back drilled via.

Capability:

Minimum Back Drill to copper :
0.15mm (Upto 6L)
0.20mm (>6L upto 20L)

Minimum stub length: 0.25mm

Maximum Aspect Ratio: 12:1



Via Type:

Aluminium Metal core PCB.

Capability:

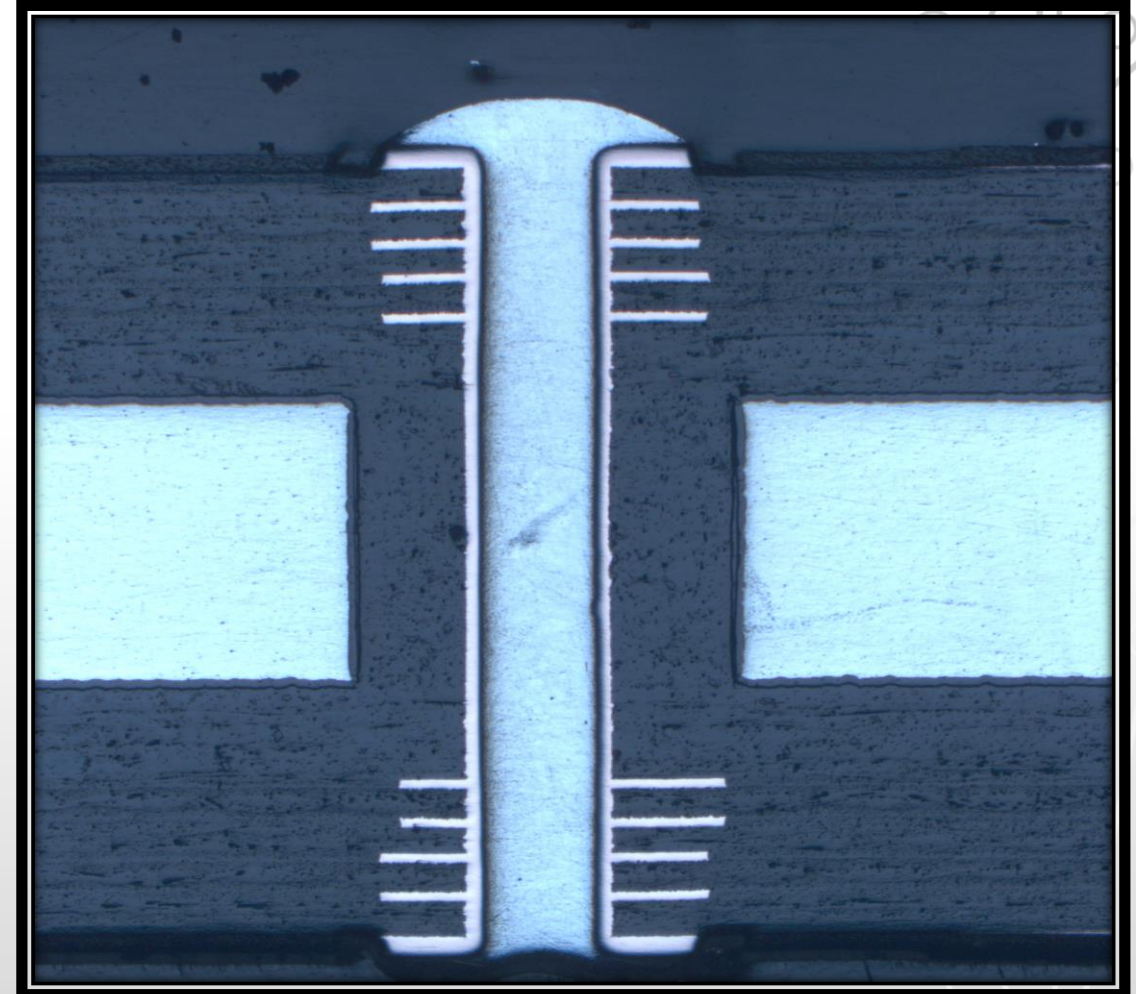
Minimum Drill Diameter (PCB) : 0.15mm

Minimum Drill Diameter Aluminium core: 0.80mm

Minimum metal to PTH distance: 0.70mm

Maximum Aluminium metal thickness: 1.6mm

Maximum Aspect Ratio: 12:1



Via Type:

Copper Metal core PCB.

Capability:

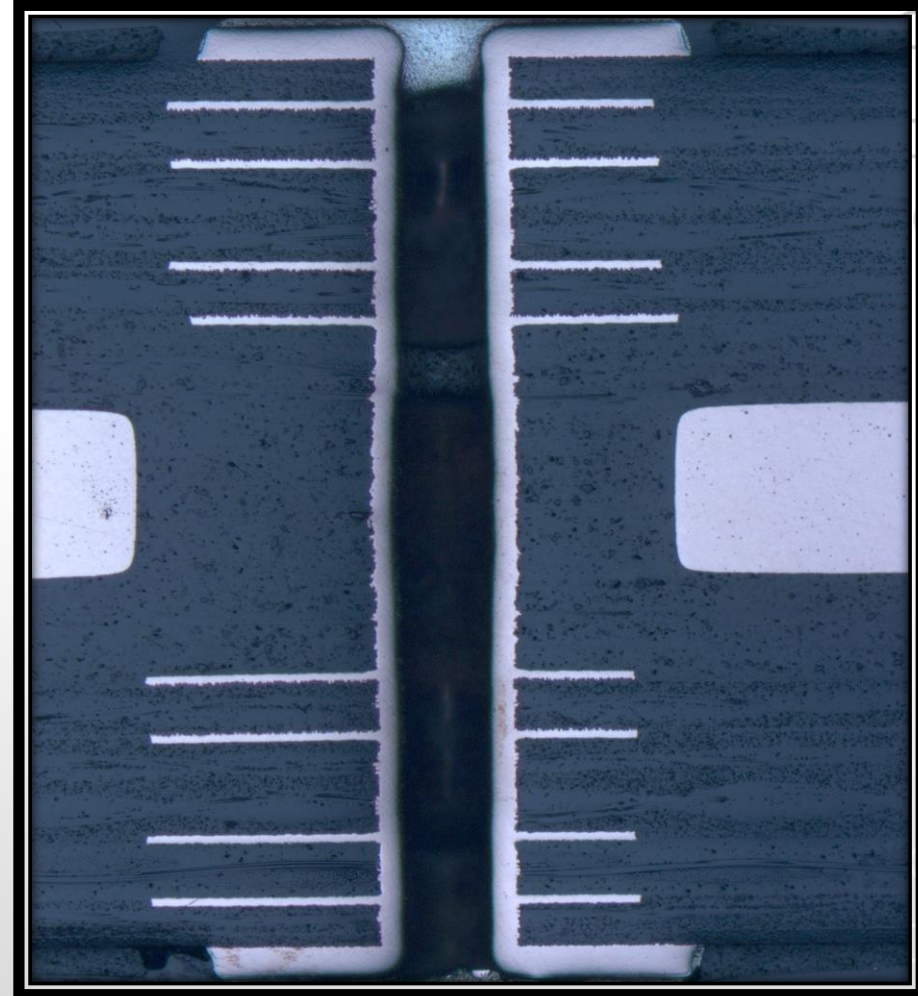
Minimum Drill Diameter (in PCB) : 0.15mm

Minimum Drill Diameter in Copper core: 0.70mm

Minimum metal to PTH distance: 0.70mm

Maximum copper metal thickness: 1.00mm

Maximum Aspect Ratio (PCB) : 12:1



Via Type:

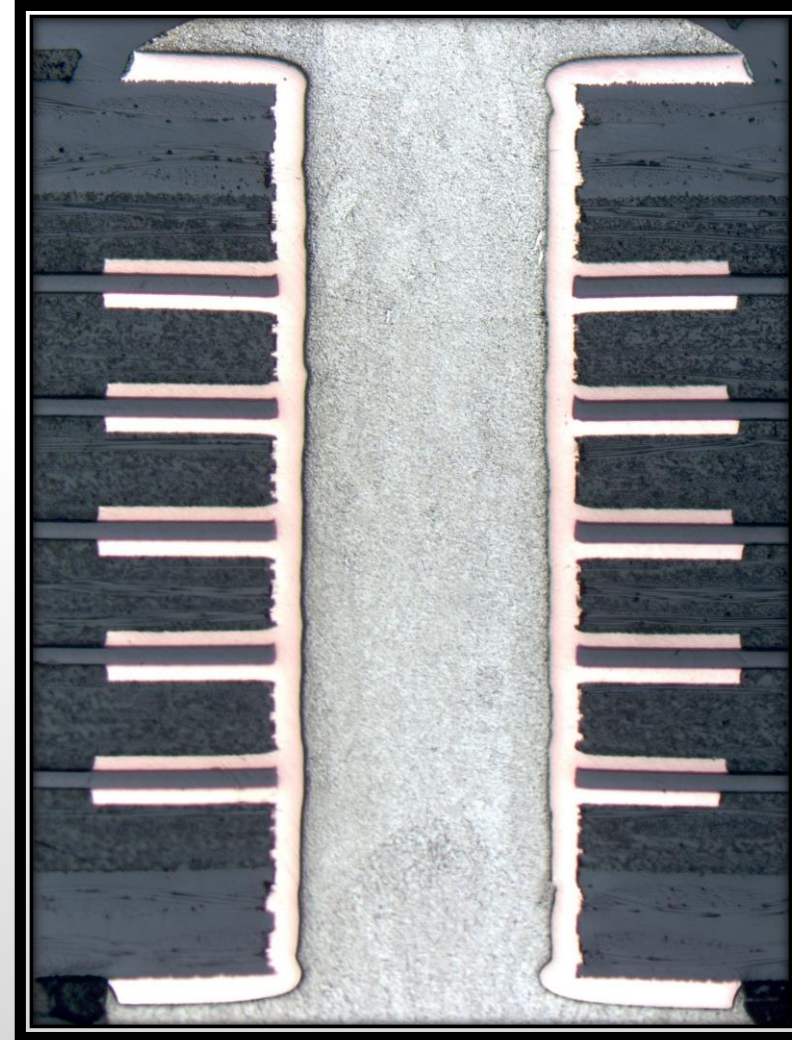
Rigid Flex PCB

Capability:

Minimum mechanical Drill Diameter : 0.15mm

Maximum Flexible Layers: 18

Maximum Aspect Ratio: 12:1



PCB Type:

Power supply PCBs

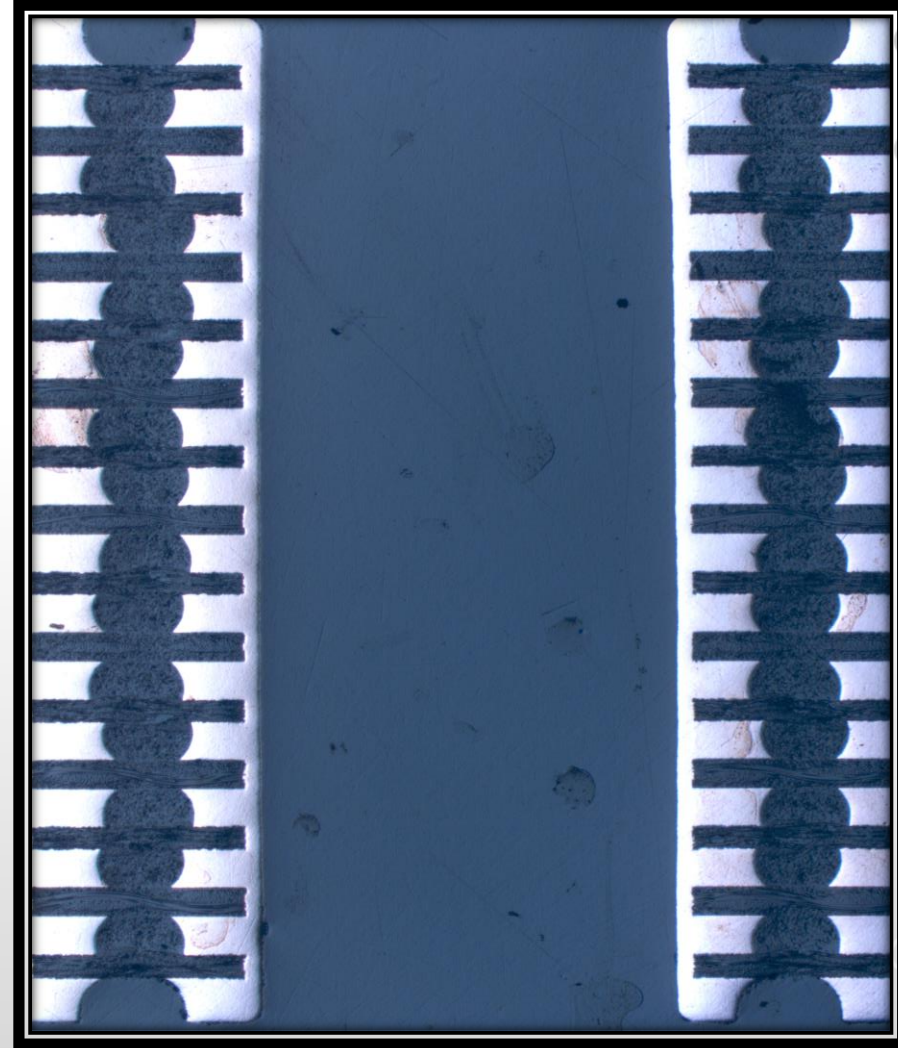
Capability:

Maximum Inner Layer Copper Thickness : 6oz

Minimum Drill Diameter : 0.3mm

Maximum copper plating thickness in PTH: 90 μ m

Maximum Aspect Ratio: 12:1



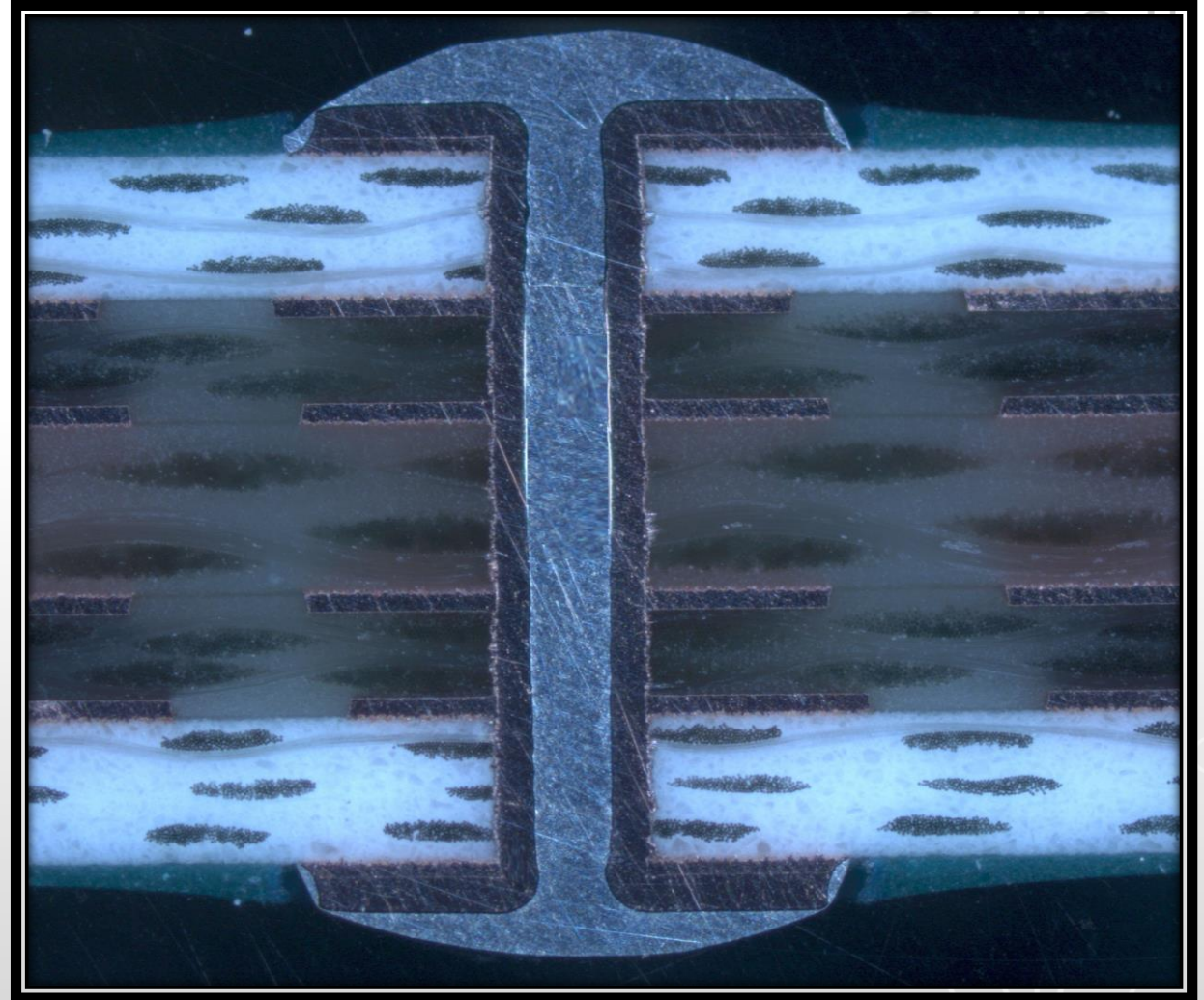
Via Type:

**Through Hole. Hybrid PCB
(Material: FR4 + ROGERS 4350B)**

Capability:

Minimum Drill Diameter : 0.15mm

Maximum Aspect Ratio: 12:1



Future Technology Road Map

Technology

Product

- 50 μ m Teace Spacing
- 60~70 Layers PCB
- Aspect Ratio 30:1
- MSAP (Modified Semi Additive Process)
- Optical Wave Guide PCB
- High Thermal Conductive Material
- Embedded Capacitors

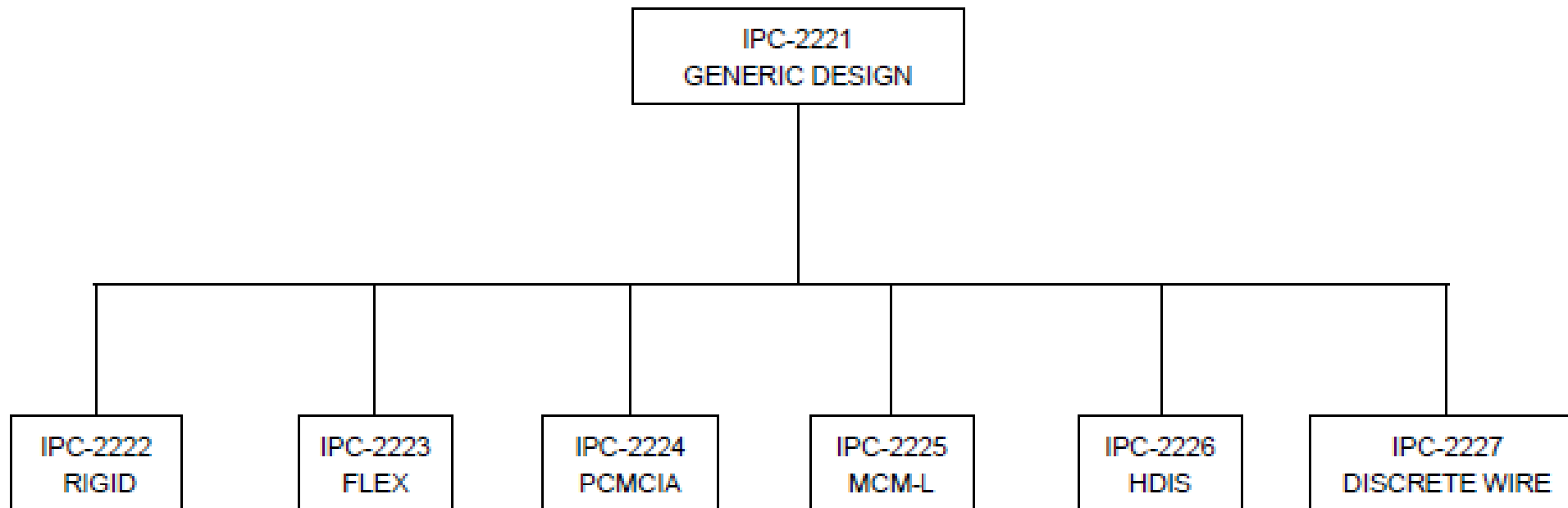
- Electroless Nickel Electroless Palladium Immersion Gold (ENEPIG)
- Large Size Mutillayer – 1500 mm PCB
- Electroless Palladium Autocataylic Gold (EPAG)

Performance of PCBs depends on :

- Design
- Raw materials
- PCB Manufacturing & Acceptance
- Assembly

PCB Design Aspects

HIERARCHY OF IPC DESIGN SPECIFICATIONS
(2220 SERIES)



Source : IPC 2221

Inputs to be considered for design

- Raw material details
- Minimum line width/ spacing
- Minimum line to pad (component) space
- Minimum line to via space / Pad to pad space / Via to via space
- Minimum via size / pad size / annular ring
- Anti-pad size in planes
- Minimum hole diameter
- Minimum pad diameter
- Drill edge to track spacing in inner signal
- Impedance requirements

Inputs to be considered for design:

- Specification details MIL-PRF-31032, IPC, ISRO-PAX-304
- Basic dimensions (length, width, thickness)
- Hole diameters (including that of VIAs)
- SMT device pitches
- Via fill / protection type (IPC4761 Type VI / VII)
- Electrical continuity/ isolation requirement
- Thermal stress requirements
- Soldermask / Surface finish (HASL , ENIG)
- Group 'B' test requirements (when required)

Hierarchy of requirements :

- Purchase Order
- Part Drawing / Statement of Work (SOW) / Part specific **KCs**
- Customer Specifications
- MIL-PRF-31032 and applicable MIL Specification sheets
- IPC Performance Specifications for PCBs (IPC6012, IPC6013, IPC6018)
- IPC PCB Acceptance IPC-A-600

Raw Materials

Raw Materials :

- Woven Glass & High Tg Epoxy (**FR4**)
- Woven Glass & Polyimide
- Adhesiveless Polyimide Film (for Flexible PCBs)
- Woven Glass & Hydrocarbon Ceramic
- Woven Glass reinforced PTFE
- Random Glass reinforced PTFE
- PTFE with ceramic filling
- Woven Glass & **Polyphenylene Ether (PPE)** and **Polyphenylene Oxide (PPO)**
- Type of Copper foils (HTE / RA / RTF)
- Solder Mask
- Legend Marking

Raw Materials :

ELECTRICAL CONSIDERATIONS :

- Dielectric Constant (Dk) or Permittivity
- Dissipation factor (Df) or Loss Tangent
- CAF Resistant
- Dielectric breakdown
- Copper Clad / Prepreg build type

Raw Materials :

MECHANICAL CONSIDERATIONS :

- Glass transition temperature (T_g)
- Decomposition Temperature (T_d)
- Co-efficient of Thermal Expansion (CTE)
- Peel strength (Cu foil type)
- Moisture absorption
- Lead Free Reflow compatible
- Fillers
- Out gassing

Raw materials (Class A):

Standard High Tg FR4 :

ISOLA-FR370HR
ITEQ - IT180ATC
TUC TU768, TU862HF
VENTEC VT47

High Speed Low Loss :

ISOLA-I-Tera MT40, AstraMT77
PANASONIC - Megtron 6, 7
TUC TU933, TU883, TU872SLK

Rigid Polyimide :

VENTEC-VT901
ARLON 35N, 85N

Flexible Materials :

DUPONT - Pyralux
PANASONIC - Felios
THINFLEX - A&W

PTFE :

ROGERS-RT Duroid 3000, 5000 & 6000
HYDROCARBON CERAMIC :
ROGERS- 4000 series

Embedded Resistors :

Ohmegaply / Ticer
Insulated Metal Substrate (IMS) :
Aismalibar / Bergquist / Polytherm

ELECTRA (UK) :

EMP110/5816 - SolderMask
EL16 - Legend Printing Ink (Screen Print)

TAIYO (Japan / USA)

PSR4000GP01EU DG - SolderMask
IJR 4000 MW300 - Legend Printing Ink
THP100DX1-HTG - NCVF Ink for via filling

PCB Manufacturing

Manufacturing Process Flow (# of Process Steps) :

	Without via in pad	With via in pad
Standard-MLB	48	62
Standard-2L	34	48
RF-MLB	60	74
RF-2L	46	60
Rigid-Flex	67	81

Note : Each step is carried out by trained and skilled operators using specialized machines.

Types of vias for interconnectivity :

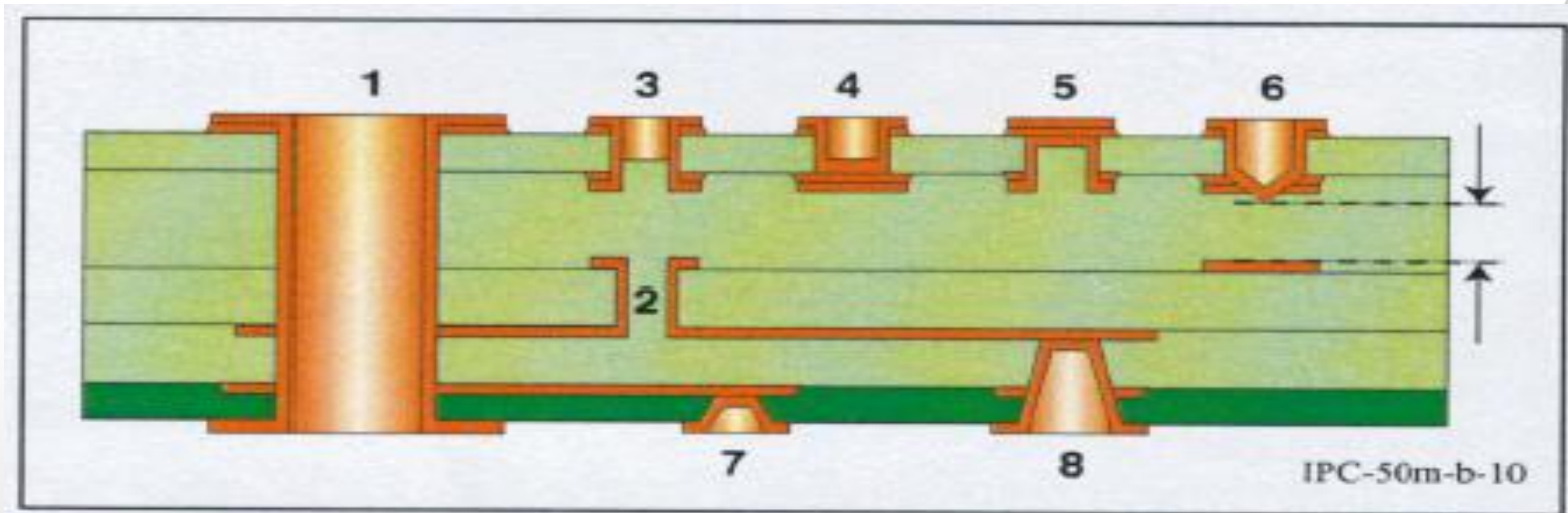


Figure B-10 Blind and Buried Vias

- | | |
|--|----------------------------------|
| 1. Standard Through Via | 5. Reverse Blind Via |
| 2. Standard Buried Via | 6. Controlled Depth Drill |
| 3. Semi-blind (Semi-buried) via | 7. Photo Defined Via |
| 4. Blind Via (Laser Drilled) | 8. Trepanned Via (Laser) |

Source : IPC-T-50

Critical Process Aspects :

With the right Design & Material, Reliability will be built into the PCBs by having the following Quality Systems :

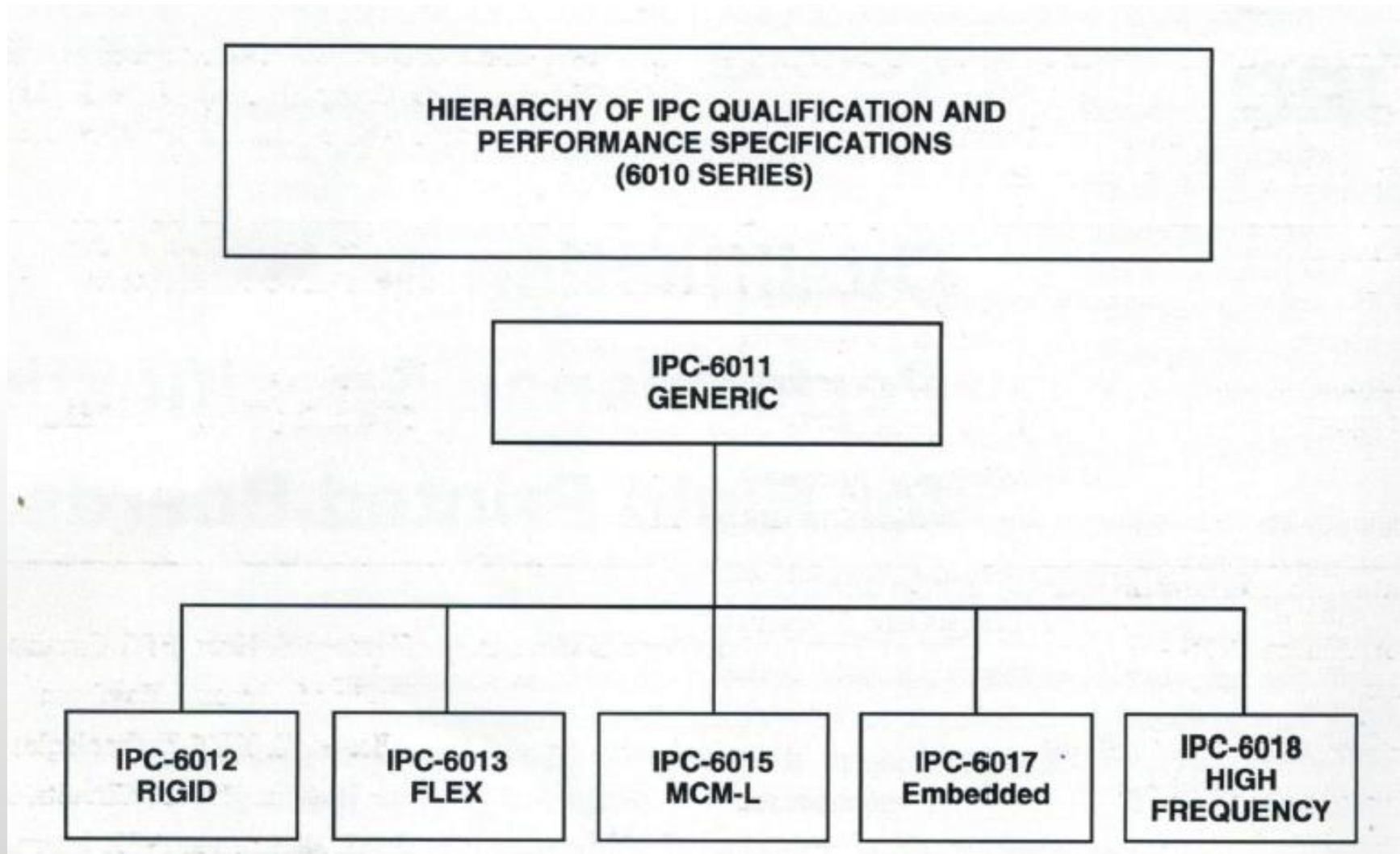
- Defined Process Flow / Configuration Management
- **PFMEA**
- **MSA**, Calibration
- **Control Plan** (where controls for each process steps are clearly defined and documents)
- **Quality Plan** (where acceptance criteria are defined and documented at all critical processes)
- Work Instructions (**WI**), Standard Operating Procedures (**SOP**), Machine Checklists, Process Checklists, Process control logs, etc.
- Effective control of **FODs**
- Effective controls on the procurement to prevent counterfeit materials
- Regular Internal Audits (System / Process Audits)

Critical Process Aspects :

Critical Controls :

- Raw Material Stores with Cold Storage facility (2 zones)
- Strict control on **FOD** / Regular particle count measurements
- Defined control on Handling of Raw materials / semi-finished / finished PCBs
- **LDI** (Laser Direct Imaging) and **MDI** (Multi-Diode Imaging) used for all Imaging
- All Imaging process are done in Clean room (ISO Class 6 of ISO 14644-1)
- **Laser Drilling** is done for microvias
- Continuous Training and Skill Development of operators
- Machine validation / Process Validation
- Calibration of test & measurement equipment

PCB Inspection & Testing



Source : IPC-6012.

Types of testing :

- Incoming Testing
- In-process Testing
- Quality Conformance Testing
- Qualification Testing
- Reliability Testing

CATOGERY	TEST / VERIFICATION
VISUAL	<ul style="list-style-type: none"> • 100% AOI (for IL & OL) • Visual Inspection • Structural integrity verification – Microsection analysis • Solderability and Rework simulation
DIMENSIONAL	<ul style="list-style-type: none"> • Dimensional / Mechanical measurements, Bow & Twist, Hole Dia verifications (Mechanical instruments, VMM)
CHEMICAL	<ul style="list-style-type: none"> • Plating coating verification by XRF • Ionic contamination testing • Purity of plated copper
ELECTRICAL	<ul style="list-style-type: none"> • Electrical testing – 100% Flying Probe Testing, IR, LCR • Impedance testing • Interconnect Stress Test (IST) • Moisture & Insulation Resistance (MIR) with Dielectric Withstanding Voltage (DWV)
MECHANICAL	<ul style="list-style-type: none"> • Adhesion tests (Plating, Coating and Marking) • Mechanical tests – Peel and Pull strength • Tensile strength & Elongation
ENVIRONMENTAL	<ul style="list-style-type: none"> • Thermal stress (Solder float, Solder Dip & Reflow) • Highly Accelerated Thermal Shock (HATS) (-65°C to +265°C) • Thermal Cycling Chamber will be installed by March 2026
GROUP--A/GROUP-B/ GROUP-C/LCI/PCI	<ul style="list-style-type: none"> • MIL-PRF-31032, MIL-PRF-55110 & MIL-PRF-50884
QUALITY CONFORMANCE INSPECTION	<ul style="list-style-type: none"> • IPC-6012, IPC-6013, IPC-6018

Note :

All above listed tests are conducted inhouse (except purity of plated copper & Thermal shock). We have **DLA approval** for conducting these tests. Thermal Cycling Chamber is expected to arrive by March 2026.

We are in the process of getting our Test Lab certified to ISO17025 – NABL Certification

Assembly Related

Assembly Related Aspects :

- Assembly House need to know and understand the PCB build and raw material properties
- Handling & Storage of PCBs. PCBs shall be stored in original moisture barrier bags that are vacuum sealed. If PCBs are taken out from the MBBs, please store it in a condition where the humidity is <10% RH.
- Number of reflow cycles with a peak temperature which will be beyond the Tg of any material significantly affects the life and performance of the PCB.
- Localized rework like component removal / replacement will have additional localized stress on the PCB. Pre-heating is recommended for such activities.
- Many of the high reliability boards continue to be hand soldered. Hand soldering, by its nature is uncontrolled.
- Raw materials used for HSD & RF circuits are brittle / soft and the Cu foils used for such materials is with low profile. So, adhesion will naturally be low compared to traditional PCBs.
- Aspects to be taken care in hand soldering :
 - Controlled soldering tip temperature & soldering duration
 - Staggered soldering to reduce the localized heating up of the PCBs
 - Pre-heat the PCBs before hand soldering

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Thank you

