• **Founded in 1999,** Candor is an industry leader in High Technology Printed Circuit Board Fabrication Services.
• Quick turn services and medium volume capability provide OEM and EMS enterprises with a precise, accurate and dependable solutions partner.
• Candor leverages its engineering expertise and superior innovative technology to deliver a competitive advantage to our customers.
• Experience in Wireless, Industrial, Medical, RF, Video and Telecom.
• Candor is committed to superior customer service, working to deliver a unique solution that will meet your specific requirements.
Corporate Profile

- Privately owned and operated since 1999
- Environmentally friendly, state of the art, automated facility
- Only facility of its kind worldwide, located in Toronto, Canada

- Wireless, Industrial, Aerospace, Automotive, Medical, RF, Video & Telecom/Communications

- Unique Electro-deposited Photoresist technology

- ISO9001 Quality Systems Cert# 58402
- UL796/94 Underwriters Laboratories UL# 216302
- CGRP Controlled Goods (ITAR) Cert# 23759
- JCP Joint Certification Program Code L5240
The Simplified Process

Designed by Yogen Patel to offer the customer a seamless transition towards a superior product.

The Design Concept for this process must favour these Objectives:

• Customer Product Benefit (Functional, Qualitative, Aesthetic)
• Mechanical / Electrical Superiority and/or Stability,
• Operator Friendly (Simple, Repetitive, Basic Technical Skills)
• Environmentally Friendly (Reduce, Re-use, Recycle),
• Regulatory Compliance (Surpass Restrictions with Less Water),
• Fewer Process Steps (symptom of On-Time Delivery),
• Process Control Advantage (less monitoring, ease of use)
Conventional Vs Simplified

Electroless Demarcation

Graphite Interface
Conventional Vs Simplified

TOCs with Dry Film

Panel Plating
Conventional Vs Simplified

Overhang & Undercut

Acid Etching
Conventional Vs Simplified

Soft Resist

Hard Resist - Print & Etch
Conventional Vs Simplified

Book Heat

Panel Heat

Multilayer Book

LEGEND
- Registration Pin
- Lamination Plate
- Separator Plate
- Multilayer Stack
- Release Sheet
- Press Pad
Conventional Vs Simplified

Lazer Ablation

Controlled Depth Via
Candor Industries Inc
Simplified Process versus Conventional Process

Pros
- Hard Material
  - PPG
  - Expose
  - Dev/Etch/Strip

Simplified
- Separator Plates
  - Continuous Foil, Even Heat, Less Pressure, Better Control
- Recycle Copper

Basic Steps
- Inner Layer Image Transfer
  - Tooling
    - AOI, Oxide
- Drilling
  - Metallization
    - Electroless Copper

Conventional
- Film Lamination
  - Expose
- Remove Sheet
  - Dev/Etch/Strip

- Pin Caul Plates
  - Press Lay Up
  - 12 Prls / Book
  - Debook

- Caul Plates, Separator Plates, Tooling Pins, Lag Paper, Separator Sheets
- Heat Differential, More Pressure, Less Control

Cons
- Soft Material, Sheet Disposal
- Very Pure, Hi Tensile, Hi Elongation, Hard Material, Sharper Trace
  - Panel Plate
    - PPG
    - Expose
    - Dev/Etch/Strip

Final Finishes
- Routing Scoring Beveling

Sharp Character
- Smaller Font Size
  - Photo-Image

Secondary Image
- Primary Image

Image Deposit
- Grainy Character Blotchy
Products:

- Single side, double side and multi-layer PWBs.
- Multi-layers up to 24 layers
- Multilayer Bonded to Substrate (copper, aluminum)
- Flex, Rigid Flex PWB’s
- Blind / Buried Via’s / Via-in-Pad
- Filled (conductive and non-conductive) Via’s,
- Landless Via’s
- Controlled Impedance +/- 5%
- Hybrid PWB
Services:

- 24 hrs proto-typing (up to 6 layers).
- 2 days proto-typing (up to 8 layers)
- 5 days proto-typing (up to 16 layer)
- Proto-types (up to 24 layers)
- Interconnect Stress Testing (IST) to estimate the long term reliability of plated interconnects.
Value Added Services

IST Testing
- Standard 20-150°C
- Lead Free 20-260°C
- Landless Via Testing

Engineering Design Support
- DFM ~ Design for Manufacturability
- DCR ~ Design for Cost Review
- DRC ~ Design Rule Check
- Impedance Modeling
- Netlist Extraction and Comparison

Technical Seminars

Purity, Tensile and Elongation
Customized Inventory Management
Failure & Destructive Analysis Services
Via-in-Pad
Landless Via’s
Controlled Depth Via’s
Rigid Flex Multi-Layer

Flex-Rigid 6-Lyr Impedance
Flex Technologies
Hi-Frequency Technologies
3D Research & Development

3 Dimensional R&D Liquid PiP
PCB Fabrication

- Front End Engineering
- Inner Layer Process (Image, Etch, Punch)
- Lamination
- Drilling
- Plating (Graphite, Image, Copper )
- Soldermask & Idents
- Final Finish (ENIG, HASL, Silver, OSP, Tin)
- Routing, Scoring, Jump-Scoring
- Final Inspection, FQA
- Electrical Test, AOI, X-Section
Surface Finishes

SMOBC  Solder Mask over Bare Copper
ENIG   Electroless Nickel/Immersion Gold
OSP    Organic Solderability Preservative
Tin    Immersion Tin
Silver Immersion Silver
HASL   Hot Air Solder Level
HAL    Lead Free HASL

Immersion Silver
Immersion Tin
Deep Hard Gold
Deep Soft Gold
Selective Nickel / Hard Gold Tips
Conductive Carbon Ink
Conductive Via Fill (CB100)
Materials

Standard Materials:
- Tg 130
- Tg 150
- Tg 170

High Temperature RoHS Materials:
- 1755V Panasonic
- IS-408 (Tg 180º C) – High Tg Low Dk (3.8)
- Nelco 4000-13 – High Tg Low Dk (3.8)
- PTFE/ Teflon
- Taconic

Specialized Materials
- Arlon 25N, 25FR, 85N, etc
- BT-Epoxy (G200, GETEK)
- Polyimide Tg 260
- Rogers 3000, 4000, 5000, 6000

Thermal Management
- Thermagon (Boron Nitride),
- ABC4000 to ABC8000 (Alumina)

Flex Materials:
- DuPont, Apexyl, Panasonic
- Coverlay LF and FR Series
- Covercoat Technic L1000
RoHS / Lead-Free

- RoHS – Restriction of Hazardous Substances
- RoHS / Lead-Free Surface Finishes
- RoHS Base Material, Solder Mask
- Lead-Free Assembly Compatible

RoHS 2002/95/EC
RoHS 2002/95/EC Pb
Metallization Processes

Electroless Copper (Conventional)

- Cleaner/Conditioner
- Rinse
- Rinse
- 10% sulfuric acid dip
- Rinse
- Rinse
- Micro Etch
- Rinse
- Rinse
- Pre-Dip
- Catalyst
- Rinse
- Rinse
- Accelerator
- Rinse
- Electroless Copper
- Rinse
- Rinse
- 10% sulfuric acid dip
- Rinse
- Rinse
- Copper Inhibitor
- Rinse
- Rinse
- Dry

Candor’s Simplified Process

- Cleaner Conditioner
  - Rinse
- Conductive Colloid
- Fixer / Rinse
- Dry
- Micro-etch
  - Rinse
- Anti-tarnish
  - Rinse
- Dry

Dry
Benefits of Panel Plating

- Perfect Distribution Hole to Surface
- Superior Tensile and Elongation
- Better Grain Structure
- Near Zero TOC’s (Organics)
- Better for Impedance Control
- No Pattern = No Handling Shorts
- No Resist = No Resist Breakdown

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<td>Purity (%)</td>
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Table 1: Tensile, Elongation & Purity
Comparing Cost

Why isn’t it Cheaper?

Conventional Process

- 30% Labour, Controls
- 10% PWB Material
- 10% Other Materials
- 20% Chemical Cost
- ??% Profit to R&D
- ??% Profit Re-Invested
- ??% Profit Realized

Simplified Process

- 20% Labour, Controls
- 10% PWB Material
- 5% Other Materials
- 35% Chemical Cost
- 15% Profit to R&D
- 15% Profit Re-Invested
- 0% Profit Realized
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<thead>
<tr>
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<th>Simplified Process</th>
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<tr>
<td>• Formaldehyde</td>
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<tr>
<td>• EDTA</td>
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<tr>
<td>• Ammonia</td>
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<td>• Monoethanololomine</td>
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</tr>
<tr>
<td>• Lots of Water</td>
<td>• 30% Less Water</td>
</tr>
<tr>
<td>• More Chemistry</td>
<td>• Less Chemistry</td>
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<tr>
<td>• More Waste Treatment</td>
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Comparing Quality: Why is it Better?

Conventional Process

- Variable Heat in Stack (M/L)
- Variable Resin Cure (M/L)
- Porous Copper Interface
- Lower Tensile Copper
- Lower Elongation Copper
- Lower Purity Copper
- Less Defined Traces
- No Landless Vias
- OK Controlled Impedance

Simplified Process

- Precise Heat in Stack (M/L)
- Precise Resin Cure (M/L)
- Pure Copper Interface
- High Tensile Copper
- High Elongation Copper
- Higher Purity Copper
- More Defined Traces
- Landless Vias
- Better Controlled Impedance
In the Conventional Process, Operators are exposed to many hazardous chemicals on a daily basis.

Because of the nature of the Conventional Process, there is no way to guarantee zero exposure.

If you can smell these chemicals, they are also being absorbed though your skin and lungs.

Candor’s Simplified Process eliminates any exposure to these hazardous chemicals.
Certificates – ISO9001:2008
Aerospace Quality Management System

CERTIFICATE OF REGISTRATION

This is to certify that

Candor Industries Inc.
9–125 Martin Ross Ave, Toronto, Ontario M3J 2L9 Canada

operates a Quality Management System
which complies with the requirements of

ISO 9001:2008 for the following scope of registration
Manufacture of printed circuit boards.

Certificate No.: CERT-0058402
File No.: 1097282
Issue Date: July 16, 2012

Original Certification Date: July 28, 2008
Current Certification Date: August 12, 2012
Certificate Expiry Date: August 11, 2015

Chin Jung
President
QMI-Sai Canada Limited

Guillaume Gagnon, Inc.
Vice President, Certification Operations, Accreditation & Quality
QMI-Sai Canada Limited

ANAB
ISO 9001

SAI GLOBAL
Certificates - UL
UL796E10 + UL94 C1s V-0

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*Published on 09-22-20*
Certificates - JCP

Joint Certification Program

UNITED STATES/CANADA JOINT CERTIFICATION OFFICE
DEFENSE LOGISTICS INFORMATION SERVICE
74 WASHINGTON AVENUE NORTH, SUITE 7
BATTLE CREEK, MICHIGAN 49017-3684

IN REPLY TO:
DLIS-SXB (Ms. Angus/Mr. Riley)

SUBJECT: DD Form 2345 Approval

Dear Madam/Sir:

Our approval of your application for certification under the U.S./Canada Joint Certification Program is enclosed. The certification number assigned to your facility is shown in Item 7.b. of the returned DD Form 2345, and is valid for a renewable five year period. A copy of the form and a statement of intended data use should accompany all future requests for unclassified military critical technical data initiated by your facility.

Certified contractors should submit a revised DD Form 2345 whenever information previously furnished becomes outdated - if, for example, name of the company, new Data Custodian is designated by the certified contractor, or if there is a change of address information. The DD Form 2345 is available on our website as an fillable .pdf format www.dlis.dia.mil/jcp/ click on DOCUMENTS.

A copy of the pamphlet "Control of Unclassified Technical Data with Military or Space Application" is available for downloading on the U.S./Canada Joint Certification website www.dlis.dia.mil/jcp/ click on DOCUMENTS. The purpose of this pamphlet is to explain the scope of the certification program. We urge you to review the guidelines and procedures outlined in the pamphlet.

Please contact either of the undersigned at 1-800-352-3572 should you have any questions regarding the certification program.

Sincerely,

RACHELLE ANGUS
Canada Representative

STEPHEN G. RILEY
United States Representative

1 Encl