



ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

IPC-1710A

OEM Standard for Printed Board Manufacturers' Qualification Profile

Developed by the OEM council of the IPC, the MQP sets the standard for assessing PWB manufacturers capabilities and allows PWB manufacturers to more easily satisfy customer requirements.

IPC-1710A
May 2004

A standard developed by IPC

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The material in this standard was developed by the OEM Council of the Institute for Interconnecting and Packaging Electronic Circuits.

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FOREWORD

It is not intended that this Manufacturers' Qualification Profile (MQP) satisfies all the requirements of the customer, however, conscientious maintenance of this document and or registration to ISO 9000 requirements should satisfy the major concerns. Thus, audits should be simpler, required less frequently, and facilitate less paper work as customers and suppliers work closer to meeting each others needs.

ACKNOWLEDGMENTS

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SECTION 1.1

COMPANY DESCRIPTION

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

GENERAL INFORMATION

| | | | |
|--|-----------------------------|--|--|
| LEGAL NAME Triangle Circuits of Pgh | | | |
| PHYSICAL ADDRESS 931 Third St | | | |
| CITY Oakmont | STATE Pa | ZIP 15139 | |
| PROVINCE | COUNTRY USA | | |
| TELEPHONE NUMBER (412)828-5322 | FAX NUMBER (412)828-5803 | TELEX NUMBER | |
| E-MAIL ADDRESS sales@trianglecircuits.com | MODEM NUMBER | DATE FOUNDED 1979 X PUBLIC <input type="checkbox"/> PRIVATE | |
| INTERNET URL www.trianglecircuits.com | FTP SITE | | |

MANAGEMENT

| |
|---|
| PRESIDENT Michael D' Ambrosio Sr |
| General Manager Michael D' Ambrosio Jr |
| Operations Manager Don Burgman |
| Quality Manager Frank Padol |
| Sales/Marketing Michael D' Ambrosio Jr |
| Inside Sales Manager Jo Anne Faas |
| WASTE TREATMENT MANAGER (POLLUTION PREVENTION) Jim Clark |

| CORPORATE DESCRIPTION | NUMBER OF EMPLOYEES | | COMMENTS |
|------------------------|---------------------|----------------|----------|
| | CORPORATE | SITE | |
| DESIGN AND DEVELOPMENT | 3 | Oakmont | |
| ENGINEERING | 5 | Oakmont | |
| MANUFACTURING CONTROL | 2 | Oakmont | |
| MANUFACTURING | DIRECT | 35 | Oakmont |
| | INDIRECT | | |
| QUALITY CONTROL | QUALITY ENGINEERS | 4 | Oakmont |
| | INTERNAL AUDITORS | 2 | Oakmont |
| | GENERAL MANAGEMENT | 1 | Oakmont |
| ADMINISTRATION | 19 | Oakmont | |
| TOTAL | 58 | Oakmont | |

SECTION 1.2

SITE DESCRIPTION

(TO BE COMPLETED FOR EACH SITE)

DATE COMPLETED 10-4-2010
ATTACH APPROPRIATE CHARTS (OPTIONAL)

| MANUFACTURING FACILITY | | | |
|--|--|--------------|----------------------|
| COMPANY NAME | Triangle Circuits of Pgh | | |
| PHYSICAL ADDRESS | 931 Third St | | |
| CITY | Oakmont | STATE | Pa |
| PROVINCE | | COUNTRY | USA |
| TELEPHONE NUMBER | (412)828-5322 | FAX NUMBER | (412)828-5803 |
| E-MAIL ADDRESS | sales @ trianglecircuits.com | MODEM NUMBER | YEARS IN BUSINESS 31 |
| INTERNET URL | www.trianglecircuits.com | FTP | |
| PRINCIPLE PRODUCTS/SERVICES/SPECIALTIES | BUSINESS CHARACTERIZATION (HIGH VOLUME, QUICK TURN-AROUND, ETC.) | | |
| Printed Circuit Bd Manuf, PCB Design, Sales and Marketing, DFM | Quick-turn Proto's, low to high volume, off-shore capabilities | | |

| FACILITY MANAGEMENT | TITLE | REPORTS TO (Function/Job Title) |
|---|----------------------|---------------------------------|
| OVERALL OPERATION RESPONSIBILITY FOR THIS SITE Michael D'Ambrosio Jr | General Manager | CEO |
| MANUFACTURING Don Burgman | Operations Manager | General Manager |
| TECHNICAL/ENGINEERING John Powell | Engineering | CEO |
| MATERIALS/PRODUCTION CONTROL Rege Kuntz | Purchasing Manager | Operations Manager |
| PURCHASING Same | | |
| QUALITY Frank Padol | Quality Manager | General Manager |
| SALES REPRESENTATIVE Michael D'Ambrosio Jr | Sales Manager | CEO |
| WASTE MANAGEMENT Jim Clark | Enviromental Manager | Operations Manager |

| BUILDINGS | | | | SYSTEMS (INDICATE % COVERAGE) | | | | | | |
|-------------------|------|----------------|---------------------------|-------------------------------|---------|-------------|------------------|------------|-----------------|-------|
| | AGE | AREA (Sq. Ft.) | Construction (Wood/Brick) | Power Conditioning | Heating | Ventilation | Air Conditioning | Sprinklers | Waste Treatment | Other |
| Office | 1958 | 4000 | Brick | | 100 | 100 | 100 | 100 | N/A | |
| Manufacturing | 1958 | 20000 | Brick | 10 | 100 | 100 | 75 | 100 | 100 | |
| Storage | 1958 | 1000 | Brick | | 100 | 100 | 100 | 100 | N/A | |
| Planned additions | 1 | 500 | Metal | | | 100 | | | N/A | |

| SAFETY AND REGULATORY AGENCY REQUIREMENTS | | | |
|--|------------------------------|-----------------------------|--|
| Are fire extinguishers functional and accessible to employees? | X YES | <input type="checkbox"/> NO | What is the distance to the nearest fire station? (in minutes) 5 Minutes |
| Do you conform to local/federal environment protection agency requirements? | X YES | <input type="checkbox"/> NO | Date of last OSHA visit Date of last EPA visit 12/2/92 7/15/94 |
| Are you currently operating under a waiver or in violation of local government requirements? | <input type="checkbox"/> YES | X NO | Other Agency Audits, UL, ISO 9000, NECQ, CSA Approval and Number X UL # E76719 X ISO 9000# 9001- <input type="checkbox"/> CSA # _____ 2000 <input type="checkbox"/> Other _____ |
| Do you have a safety program? Describe below. | X YES | <input type="checkbox"/> NO | Hazardous Waste Number Trade Waste Account Number EPA # PAD981037377 |

| PLANT PERSONNEL (TOTAL EMPLOYEES) | | | | | | | | | | |
|-----------------------------------|----------|--------|-----------------------|------------|--------------|--------------|-------|-----------|------------|-------------------------|
| Regular | Contract | Office | Technical/Engineering | Production | Full-Time QA | Part-Time QA | Union | Non-Union | Union Name | Contract Expires (Date) |
| 58 | 0 | 19 | 4 | 35 | 3 | 0 | 0 | All | | |

| COMMENTS |
|--|
| Safety programs based on internal audits to OSHA standards |

SECTION 2.1

PROCESS

| |
|---------------------------------|
| DATE COMPLETED 10-4- 2010 |
|---------------------------------|

This section is intended to provide overview information on the processes used to fabricate printed board products.

Site Capability Snapshot (Please Check all that apply)

| Designators | | | Remarks |
|-------------|-----------------------------|---|---------|
| A | Conductor Forming Processes | XSubtractive <input type="checkbox"/> Thin Foil Subtractive less than .5 oz. <input type="checkbox"/> Semi-Additive <input type="checkbox"/> Additive (Electro-less) <input type="checkbox"/> Black Hole <input type="checkbox"/> Thick Film Paste and Fire <input type="checkbox"/> Thin Film Semi-conductor Sputtering <input type="checkbox"/> Other: | |
| B | PTH Materials and Processes | X Acid Copper <input type="checkbox"/> Pyro-Phosphate Copper <input type="checkbox"/> Full Built Electro-Less <input type="checkbox"/> Gold Paste <input type="checkbox"/> Copper Paste <input type="checkbox"/> Gold Conductor Sputtering <input type="checkbox"/> Nickel Conductor Sputtering <input type="checkbox"/> Other: | |
| C | Permanent Over-plating | XTin XTin-Lead <input type="checkbox"/> Tin-Nickel Alloy <input type="checkbox"/> Nickel XNickel Gold (Hard) XNickel Gold (Soft) <input type="checkbox"/> Nickel Rhodium <input type="checkbox"/> Conductive Polymer XOther: Carbon Ink, Immersion Silver, Entek, Ldfree HASL | |

| | | | |
|---|-----------------------------|---|--|
| D | Permanent Selective Plating | <input type="checkbox"/> Tin <input type="checkbox"/> Tin-Lead <input type="checkbox"/> Tin-Nickel Alloy <input type="checkbox"/> Nickel XNickel Gold (Hard) <input type="checkbox"/> Nickel Gold (Soft) <input type="checkbox"/> Nickel Rhodium XOther: Carbon Ink | |
| E | Permanent Mask or Coating | <input type="checkbox"/> Photo Dry Film XPhoto Liquid <input type="checkbox"/> Image Transfer Screen Mask <input type="checkbox"/> Conformal Coating Solder Mask <input type="checkbox"/> Cover Coat <input type="checkbox"/> Other: | |
| F | Other Surface Finishes | <input type="checkbox"/> Tin-Lead Fused XImmersion Tin XSolder Leveled <input type="checkbox"/> Roll Soldered <input type="checkbox"/> Electro-less Solder Fused <input type="checkbox"/> Solder Bumped Lands <input type="checkbox"/> Solder Paste Fused XAzole Organic Protective Covering <input type="checkbox"/> Flux Protective Covering XOther: ENIG, Immersion Silver, Ldfree HASL | |

SECTION 2.2

ELECTRICAL TEST EQUIPMENT

DATE COMPLETED
10-4-2010

This section is intended to provide overview information on the test equipment and testing capability of the manufacturer.

Site Capability Snapshot (Please Check the column that applies furthest to the right.)

| Designators | | | Remarks |
|-------------|-------------------|--|---------|
| A | Number of Nets | <input type="checkbox"/> <200 <input type="checkbox"/> 200 <input type="checkbox"/> 500 <input type="checkbox"/> 1000 <input type="checkbox"/> 2000 <input type="checkbox"/> 3000 <input type="checkbox"/> 4000 <input type="checkbox"/> 5000 X>5000 <input type="checkbox"/> Other: | |
| B | Number of Nodes | <input type="checkbox"/> <500 <input type="checkbox"/> 500 <input type="checkbox"/> 1000 <input type="checkbox"/> 2000 <input type="checkbox"/> 3000 <input type="checkbox"/> 4000 <input type="checkbox"/> 5000 <input type="checkbox"/> 6000 X>6000 <input type="checkbox"/> Other: | |
| C | Probe Point Pitch | <input type="checkbox"/> >1.0 [.040] <input type="checkbox"/> 1.0 [.040] <input type="checkbox"/> 0.8 [.032] <input type="checkbox"/> 0.65 [.025] <input type="checkbox"/> 0.50 [.020] X0.40 [.016] <input type="checkbox"/> 0.30 [.012] <input type="checkbox"/> 0.20 [.008] <input type="checkbox"/> <0.20 [.008] <input type="checkbox"/> Other: | |

| | | | |
|---|----------------------|--|--|
| D | Test % Single Pass | <input type="checkbox"/> None <input type="checkbox"/> <60% <input type="checkbox"/> 60% <input type="checkbox"/> 70% <input type="checkbox"/> 80% <input type="checkbox"/> 90% <input type="checkbox"/> 95% <input type="checkbox"/> 99% <input type="checkbox"/> X100% <input type="checkbox"/> Other: | |
| E | Probe Accuracy (DTP) | <input type="checkbox"/> >0.2 [.008] <input type="checkbox"/> 0.2 [.008] <input type="checkbox"/> 0.15 [.006] <input type="checkbox"/> 0.125 [.005] <input type="checkbox"/> 0.1 [.004] <input type="checkbox"/> 0.075 [.003] <input type="checkbox"/> X<0.075 [.003] <input type="checkbox"/> Other: | |
| F | Grid Density | <input type="checkbox"/> Single Side Grid <input checked="" type="checkbox"/> XDouble Sided Grid <input type="checkbox"/> Double Density Grid <input type="checkbox"/> Double Density Double Sided <input type="checkbox"/> Quad Density <input type="checkbox"/> Double Sided Quad Density <input checked="" type="checkbox"/> XFlying Probe <input type="checkbox"/> Other: | |
| G | Netlist Capability | <input checked="" type="checkbox"/> XGolden Board <input checked="" type="checkbox"/> XIPC-D-356 <input checked="" type="checkbox"/> XNet List Extraction <input checked="" type="checkbox"/> XCAD/CAM Net List Compare <input type="checkbox"/> Other: | |

| | | | |
|---|---------------------|---|--|
| H | Test Voltage | <input type="checkbox"/> <20 VDC <input type="checkbox"/> 20 VDC <input type="checkbox"/> 40 VDC <input type="checkbox"/> 60 VDC <input type="checkbox"/> 80 VDC <input type="checkbox"/> 100 VDC <input type="checkbox"/> X500 VDC <input type="checkbox"/> 1000 VDC <input type="checkbox"/> >1000 VDC <input type="checkbox"/> Other: | |
| J | Impedance Meas | <input type="checkbox"/> XMicro Section <input type="checkbox"/> Inboard Circuit <input type="checkbox"/> XCoupon <input type="checkbox"/> XManual TDR <input type="checkbox"/> Automated TDR <input type="checkbox"/> Other: | |
| K | Impedance Tolerance | <input type="checkbox"/> None <input type="checkbox"/> >20% <input type="checkbox"/> 20% <input type="checkbox"/> 15% <input type="checkbox"/> 10% <input type="checkbox"/> 7% <input type="checkbox"/> X5% <input type="checkbox"/> 2% <input type="checkbox"/> <2% <input type="checkbox"/> Other: | |

SECTION 2.3

PRODUCT TYPE

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

This section is intended to provide overview information on the printed board product types being fabricated by the manufacturer.

Site Capability Snapshot (Please Check all that apply.)

| Designators | | Remarks |
|-------------|-----------------------|---|
| A | Product Type | <input checked="" type="checkbox"/> Rigid Printed Board <input type="checkbox"/> Flex Printed Board <input type="checkbox"/> Rigid/Flex Board <input type="checkbox"/> Rigid Back Plane <input type="checkbox"/> Molded Product <input type="checkbox"/> Ceramic Printed Board <input type="checkbox"/> Multichip Module <input type="checkbox"/> Laminated Multichip Module <input type="checkbox"/> Deposited Dielectric Multichip Modules <input type="checkbox"/> Other: |
| B | Circuit Mounting Type | <input checked="" type="checkbox"/> Single Sided <input checked="" type="checkbox"/> Double Sided <input checked="" type="checkbox"/> Multilayer <input type="checkbox"/> Single-sided Bonded to Substrate <input type="checkbox"/> Double-sided Bonded to Substrate <input type="checkbox"/> Multilayer Bonded to Substrate <input type="checkbox"/> Constrained Multilayer <input type="checkbox"/> Distributed Plane Multilayer <input type="checkbox"/> Other: |
| C | Via Technology | <input type="checkbox"/> No-Vias <input checked="" type="checkbox"/> Thru Hole Vias <input checked="" type="checkbox"/> Buried Vias <input checked="" type="checkbox"/> Blind Vias <input checked="" type="checkbox"/> Thru Hole & Blind Vias <input checked="" type="checkbox"/> Thru Hole & Buried Vias <input checked="" type="checkbox"/> Thru Hole Buried & Blind Vias <input checked="" type="checkbox"/> Buried & Blind Vias <input type="checkbox"/> Other: |

| | | | |
|---|------------------------|--|--|
| D | Laminate Material | <input type="checkbox"/> Phenolic <input type="checkbox"/> Epoxy Paper XEpoxy Glass <input type="checkbox"/> Modified Epoxy Composite <input type="checkbox"/> Polyimide Film & Reinforce <input type="checkbox"/> Cyanate Ester XTeflon <input type="checkbox"/> Ceramic Glass Types <input type="checkbox"/> Various Combinations XOther: Rogers, Taconic | |
| E | Core Material | <input type="checkbox"/> No Core <input type="checkbox"/> Polymer XCopper <input type="checkbox"/> Aluminum <input type="checkbox"/> Graphite <input type="checkbox"/> Copper Invar/Copper <input type="checkbox"/> Copper Moly/Copper <input type="checkbox"/> Other: | |
| F | Copper Thickness (Oz.) | <input type="checkbox"/> 1/8 Minimum X1/4 Minimum <input type="checkbox"/> 3/8 Minimum <input type="checkbox"/> 1/2 Nominal <input type="checkbox"/> 1 Nominal <input type="checkbox"/> 2 Nominal X3-5 Max <input type="checkbox"/> 6-9 Max <input type="checkbox"/> >10 <input type="checkbox"/> Other: | |
| G | Construction | X≤4 Planes X>4 Planes XTHK to TOL ≤0.2 mm <input type="checkbox"/> THK to TOL >0.2 mm XBow/Twist ≤1% <input type="checkbox"/> Bow/Twist >1% X≤0.3 mm Profile Tolerance <input type="checkbox"/> 0.3 mm Profile Tolerance <input type="checkbox"/> Other: | |

| | | | |
|---|-----------------------|--|--|
| H | Coatings and Markings | <p>X ≤ 0.1 mm Mask Clearance</p> <p><input type="checkbox"/> > 0.1 mm Mask Clearance</p> <p>X One Side (Legend)</p> <p>X Two Side (Legend)</p> <p>X None (Legend)</p> <p>X U.L. Material Logo</p> <p>X U.L. V₀ Logo</p> <p><input type="checkbox"/> U.L. V₁ Logo</p> <p><input type="checkbox"/> U.L. V₂ Logo</p> <p><input type="checkbox"/> Other:</p> | |
|---|-----------------------|--|--|

SECTION 2.4

PRODUCT COMPLEXITY

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

This section is intended to provide overview information on product complexity being fabricated by the manufacturer.

(Please check the column that applies farthest to the right)

| Designators | | | Remarks |
|-------------|--------------------------|--|---------|
| A | Board Size Diagonal | <input type="checkbox"/> <250 [10.00] <input type="checkbox"/> 250 [10.00] <input type="checkbox"/> 350 [14.00] <input type="checkbox"/> 450 [17.50] <input type="checkbox"/> 550 [21.50] <input type="checkbox"/> 650 [25.50] <input type="checkbox"/> X750 [29.50] <input type="checkbox"/> 850 [33.50] <input type="checkbox"/> >850 [33.50] <input type="checkbox"/> Other: | |
| B | Total Board Thickness | <input type="checkbox"/> 1,0 [.040] <input type="checkbox"/> 1,0 [.040] <input type="checkbox"/> 1,6 [.060] <input type="checkbox"/> 2,0 [.080] <input type="checkbox"/> 2,5 [.100] <input type="checkbox"/> X3,5 [.135] <input type="checkbox"/> 5,0 [.200] <input type="checkbox"/> 6,5 [.250] <input type="checkbox"/> >6,5 [.250] <input type="checkbox"/> Other: | |
| C | Number Conductive Layers | X1-4 X5-6 X7-8 X9-12 <input type="checkbox"/> 13-16 <input type="checkbox"/> 17-20 <input type="checkbox"/> 21-24 <input type="checkbox"/> 25-28 <input type="checkbox"/> >28 <input type="checkbox"/> Other: | |

| | | | |
|---|--------------------------------|---|--|
| D | Dia Drilled Holes | <input type="checkbox"/> >0,5 [.020] <input type="checkbox"/> 0,5 [.020] <input type="checkbox"/> 0,4 [.016] <input type="checkbox"/> 0,35 [.014] <input type="checkbox"/> 0,30 [.012] <input type="checkbox"/> 0,25 [.010] <input type="checkbox"/> 0,20 [.008] <input type="checkbox"/> X0,15 [.006] <input type="checkbox"/> <0,15 [.006] <input type="checkbox"/> Other: | |
| E | Total PTH TOL (Max-Min) | <input type="checkbox"/> >0,250 [.010] <input type="checkbox"/> 0,250 [.010] <input type="checkbox"/> 0,200 [.008] <input type="checkbox"/> 0,150 [.006] <input type="checkbox"/> 0,125 [.005] <input type="checkbox"/> 0,100 [.004] <input type="checkbox"/> X0,075 [.003] <input type="checkbox"/> 0,050 [.002] <input type="checkbox"/> <0,050 [.002] <input type="checkbox"/> Other: | |
| F | Hole Location TOL DTP | <input type="checkbox"/> >0,50 [.020] <input type="checkbox"/> 0,50 [.020] <input type="checkbox"/> 0,40 [.016] <input type="checkbox"/> 0,30 [.012] <input type="checkbox"/> 0,25 [.010] <input type="checkbox"/> 0,20 [.008] <input type="checkbox"/> 0,15 [.006] <input type="checkbox"/> 0,10 [.004] <input type="checkbox"/> X<0,10 [.004] <input type="checkbox"/> Other: | |
| G | Internal Layer Clearance (Min) | <input type="checkbox"/> >0,350 [.014] <input type="checkbox"/> 0,350 [.014] <input type="checkbox"/> X0,250 [.010] <input type="checkbox"/> 0,200 [.008] <input type="checkbox"/> 0,150 [.005] <input type="checkbox"/> 0,125 [.005] <input type="checkbox"/> 0,100 [.004] <input type="checkbox"/> 0,075 [.003] <input type="checkbox"/> <0,075 [.003] <input type="checkbox"/> Other: | |

| | | | |
|---|--------------------------------------|---|--|
| H | Internal Layer Conductor Width (Min) | <input type="checkbox"/> >0,250 [.010] <input type="checkbox"/> 0,250 [.010] <input type="checkbox"/> 0,200 [.008] <input type="checkbox"/> 0,150 [.006] <input type="checkbox"/> 0,125 [.005] <input type="checkbox"/> X0,100 [.004] <input type="checkbox"/> 0,075 [.003] <input type="checkbox"/> 0,050 [.002] <input type="checkbox"/> <0,050 [.002] <input type="checkbox"/> Other: | |
| J | Internal Layer Process Allowance | <input type="checkbox"/> >0,100 [.004] <input type="checkbox"/> 0,100 [.004] <input type="checkbox"/> 0,075 [.003] <input type="checkbox"/> 0,050 [.002] <input type="checkbox"/> 0,040 [.0015] <input type="checkbox"/> 0,030 [.0012] <input type="checkbox"/> 0,025 [.001] <input type="checkbox"/> X0,020 [.0008] <input type="checkbox"/> <0,020 [.0008] <input type="checkbox"/> Other: | |
| K | External Layer Clearance (Min) | <input type="checkbox"/> >0,350 [.014] <input type="checkbox"/> 0,350 [.014] <input type="checkbox"/> 0,250 [.010] <input type="checkbox"/> 0,200 [.008] <input type="checkbox"/> 0,150 [.006] <input type="checkbox"/> 0,125 [.005] <input type="checkbox"/> X0,100 [.004] <input type="checkbox"/> 0,075 [.003] <input type="checkbox"/> <0,075 [.003] <input type="checkbox"/> Other: | |

| | | | |
|---|--------------------------------------|---|--|
| L | External Layer Conductor Width (Min) | <input type="checkbox"/> >0,250 [.010] <input type="checkbox"/> 0,250 [.010] <input type="checkbox"/> 0,200 [.008] <input type="checkbox"/> 0,150 [.006] <input type="checkbox"/> 0,125 [.005] <input type="checkbox"/> X0,100 [.004] <input type="checkbox"/> 0,075 [.003] <input type="checkbox"/> 0,050 [.002] <input type="checkbox"/> <0,050 [.002] <input type="checkbox"/> Other: | |
| M | External Layer Process Allowance | <input type="checkbox"/> >0,100 [.004] <input type="checkbox"/> 0,100 [.004] <input type="checkbox"/> 0,075 [.003] <input type="checkbox"/> 0,050 [.002] <input type="checkbox"/> 0,040 [.0015] <input type="checkbox"/> 0,030 [.0012] <input type="checkbox"/> 0,025 [.001] <input type="checkbox"/> X0,020 [[.0008] <input type="checkbox"/> <0,020 [.0008] <input type="checkbox"/> Other: | |
| N | Feature Location DTP | <input type="checkbox"/> >0,50 [.020] <input type="checkbox"/> 0,50 [.020] <input type="checkbox"/> 0,40 [.016] <input type="checkbox"/> 0,30 [.012] <input type="checkbox"/> 0,25 [.010] <input type="checkbox"/> 0,20 [.008] <input type="checkbox"/> 0,15 [.006] <input type="checkbox"/> 0,10 [.004] <input type="checkbox"/> X<0,10 [.004] <input type="checkbox"/> Other: | |

All Dimensions are in millimeters [inches shown in brackets]

SECTION 2.5

QUALITY DEVELOPMENT

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

This section is intended to provide overview information on the quality systems in place in the manufacturing facility.

Site Capability Snapshot (Please Check all that apply.)

| Designators | | | Remarks |
|-------------|----------------------|--|---------|
| A | Strategic Plan | XFunctional Steering Committee Formed <input type="checkbox"/> TQM Plan & Philosophy Established & Published XDocumented Quality Progress Review XImplementation & review of Project Team Recommendations XTQM Communicated throughout organization XControlled New process Start-up XManagement Participates in TQM Audits XEmployee Recognition Program <input type="checkbox"/> Total TQM Plan/Involvement Customer Training <input type="checkbox"/> Other: | |
| B | Employee Involvement | XCertified Training Available XTraining of Employee Base <input type="checkbox"/> TQM Team Trained <input type="checkbox"/> Design of Experiment Training and Use XNew Process Implementation Training XSupport Personnel Training <input type="checkbox"/> Advanced Statistical Training <input type="checkbox"/> Quality Functional Deployment XOngoing Improvement Program for Employees <input type="checkbox"/> Other: | |
| C | Quality Manual | <input type="checkbox"/> Quality Manual Started <input type="checkbox"/> Generic Quality Manual for Facility <input type="checkbox"/> 10% of manufacturing depts. have process specifications <input type="checkbox"/> 25% of manufacturing depts. have process specifications <input type="checkbox"/> 50% of manufacturing depts. have process specifications XNon-manufacturing Manuals Developed <input type="checkbox"/> 25% of all departments have quality manuals <input type="checkbox"/> 50% of all departments have quality manuals XAll Manufacturing and support depts. have controlled quality manual <input type="checkbox"/> Other: | |

| | | | |
|---|-----------------------------|---|--|
| D | Instructions | <input type="checkbox"/> Work Instructions Started <input type="checkbox"/> Quality Instructions Started <input type="checkbox"/> 10% Work Instructions Completed <input type="checkbox"/> 10% Quality Instructions Completed <input type="checkbox"/> 25% Work Instructions Completed, Controlled <input type="checkbox"/> 25% Quality Instructions Completed, Controlled <input type="checkbox"/> 50% Work Instructions Completed, Controlled <input type="checkbox"/> 50% Quality Instructions Completed, Controlled <input checked="" type="checkbox"/> Quality and work Instruct. Completed, Controlled <input type="checkbox"/> Other: | |
| E | SPC Implementation IPC-9191 | <input checked="" type="checkbox"/> Plan Exists <input checked="" type="checkbox"/> Training Started <input checked="" type="checkbox"/> Process Data Collected & Analyzed <input type="checkbox"/> All Employees Trained <input type="checkbox"/> First Process Stable & Capable <input checked="" type="checkbox"/> Several Major Processes Stable & Capable <input checked="" type="checkbox"/> Continued Improvement of Stable Processes <input type="checkbox"/> Additional Mfg Processes under Control <input type="checkbox"/> All Processes Under Control <input type="checkbox"/> Other: | |
| F | Supplier Programs/Controls | <input type="checkbox"/> Supplier Rating Program <input type="checkbox"/> Monthly Analysis Program <input type="checkbox"/> Key Problems Identified <input checked="" type="checkbox"/> Supplier Reviews Performance Data provided <input type="checkbox"/> TQM Acceptance by suppliers <input type="checkbox"/> 10% of Suppliers Using SPC <input type="checkbox"/> 25% of Suppliers Using SPC <input type="checkbox"/> 50% of Suppliers Using SPC <input type="checkbox"/> All Key Suppliers using Certified parts program <input type="checkbox"/> Other: | |
| G | Third Party IPC-QS-95 | <input type="checkbox"/> Instrument Controls in Place <input type="checkbox"/> Measurement System in Control IPC-9191 <input checked="" type="checkbox"/> Document Controls in Place <input checked="" type="checkbox"/> Reduced Lot Sampling <input type="checkbox"/> 10% of Processes Under Audit Control <input checked="" type="checkbox"/> 50% or Greater of Processes Under Audit Control <input type="checkbox"/> ISO-9003 Certified <input type="checkbox"/> ISO-9002 Certified <input type="checkbox"/> ISO-9001 <input checked="" type="checkbox"/> Other: ISO9001-2000 | |

SECTION 3**EQUIPMENT PROFILE (Pre-Site Audit)**

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

* Examples of equipment limitations include:
min/max board size & min/max working area

| 3.1 PHOTOTOOL CAPABILITY | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|---|-----|--------------------------|----------------|-----|------------------|
| A) AOI of phototool | X | <input type="checkbox"/> | Camtek | 1 | |
| B) AOI CAD reference (CAM) | X | <input type="checkbox"/> | Valor Genesis | 1 | |
| C) Photoplotting | X | <input type="checkbox"/> | Gerber Cresent | 1 | |
| D) Photo reductions | X | <input type="checkbox"/> | Sub-contracted | | |
| E) Film scan and conversion | X | <input type="checkbox"/> | Sub-contracted | | |
| F) Film processing <input type="checkbox"/> air-dried <input type="checkbox"/> force-dried X processed in automatic processor | X | <input type="checkbox"/> | Kodak | 1 | |
| G) Media types X silver halide film <input type="checkbox"/> glass X diazo | X | <input type="checkbox"/> | Dupont | | |

| 3.2 DRILLING EQUIPMENT | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|-----------------------------|--------------------------|--------------------------|-----------------------------|-----------|---------------------------------|
| A) Manual | <input type="checkbox"/> | X | | | |
| B) Optical (single spindle) | <input type="checkbox"/> | X | | | |
| C) N.C. drill | X | <input type="checkbox"/> | Pluritec Excellon Mark 6 | 2 Each | 8" 9" min pnel 20" * 24" <ax |

| 3.3 ROUTING EQUIPMENT | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|-----------------------------|--------------------------|--------------------------|-----------|-----|------------------|
| A) Edge beveler | X | <input type="checkbox"/> | Radoll | 1 | |
| B) Hand router (pin router) | <input type="checkbox"/> | X | | | |
| C) N.C. router | <input type="checkbox"/> | X | | | |
| D) N.C. driller/router | X | <input type="checkbox"/> | Excellon | 4 | |
| E) Scoring (profile) | X | <input type="checkbox"/> | Excellon | 1 | |
| F) Scoring (straight line) | X | <input type="checkbox"/> | Anita | 1 | |

| 3.4 MECHANICAL EQUIPMENT | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--------------------------|-----|--------------------------|-----------|-----|--------------------|
| A) Punch press | X | <input type="checkbox"/> | | | Off-shore supplier |
| B) Shear | X | <input type="checkbox"/> | Tenumith | 2 | |
| C) Milling machine | X | <input type="checkbox"/> | | | Sub-contract basis |

| 3.5 HOLE PREPARATION (DESMEAR) | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--------------------------------|--------------------------|--------------------------|--------------------|-----|--------------------|
| A) Permagnate | X | <input type="checkbox"/> | Tank-vertical line | | |
| B) Plasma | X | <input type="checkbox"/> | | | Sub-contract basis |
| C) Mechanical | <input type="checkbox"/> | X | | | |
| D) Etchback | X | <input type="checkbox"/> | Tank-vertical line | | |

| 3.6 PRIMARY IMAGE APPLICATION | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|-------------------------------|--------------------------|--------------------------|---------------------|-----|------------------|
| A) Dry film | X | <input type="checkbox"/> | Cut Sheet laminator | 1 | |
| B) Hand screening | <input type="checkbox"/> | X | | | |
| C) Machine screening | <input type="checkbox"/> | X | | | |
| D) Wet film | <input type="checkbox"/> | X | | | |
| E) Liquid photoimageable | <input type="checkbox"/> | X | | | |

| 3.7 TYPE OF TREATMENT FOR MULTILAYER INNERLAYERS | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--|--------------------------|--------------------------|-------------------------------|-----|------------------|
| A) Black oxide | <input type="checkbox"/> | X | | | |
| B) Red oxide | <input type="checkbox"/> | X | | | |
| C) Copper scrub | <input type="checkbox"/> | X | | | |
| D) Durabond | <input type="checkbox"/> | X | | | |
| E) Other | X | <input type="checkbox"/> | Oxide reduction Chem clean | | |

| 3.8 LAMINATION | YES | NO | MATERIAL | QTY | APPLICATION TECHNIQUE |
|-----------------------|--------------------------|--------------------------|-------------------|--------|-----------------------|
| A) High pressure | X | <input type="checkbox"/> | Burkle Walbash | 1 1 | |
| B) High temperature | X | <input type="checkbox"/> | Burkle Walbash | 1 1 | |
| C) Vacuum | X | <input type="checkbox"/> | Burkle | 1 | |
| D) Vacuum assist | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| E) Foil heat assist | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| F) Separate cool-down | X | <input type="checkbox"/> | | 2 | |

| 3.9 ELECTROLESS COPPER PLATING | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--|--------------------------|--------------------------|-----------------|-----|------------------|
| A) Fully additive application | <input type="checkbox"/> | X | | | |
| B) Electroless deposition (semiadditive) | <input type="checkbox"/> | X | | | |
| C) Through-hole and via | X | <input type="checkbox"/> | In line process | 1 | |

| 3.10 COPPER ELECTROPLATING | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|----------------------------|--------------------------|--------------------------|-----------------|-----|------------------|
| A) Copper sulfate | X | <input type="checkbox"/> | In line process | 1 | |
| B) Pyrophosphate | <input type="checkbox"/> | X | | | |
| C) Copper fluoborate | <input type="checkbox"/> | X | | | |
| D) Other | <input type="checkbox"/> | X | | | |

| 3.11 TIN/LEAD SURFACE PLATINGS/COATINGS | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--|--------------------------|--------------------------|-----------|-----|------------------|
| A) Tin/lead electroplated | <input type="checkbox"/> | X | | | |
| B) Immersion tin or tin/lead (electroless) | X | <input type="checkbox"/> | | | |
| C) Hot air solder leveled (HASL) | X | <input type="checkbox"/> | | | |

| 3.12 FUSING PROCESSES | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|-------------------------------|--------------------------|--------------------------|-----------|-----|--------------------|
| A) I.R. reflow | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| B) Hot oil reflow | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| C) Horizontal (hot air level) | X | <input type="checkbox"/> | | | Sub contract basis |
| D) Vertical (hot air level) | X | <input type="checkbox"/> | | | |

| 3.13 NICKEL SURFACE PLATING | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|-----------------------------|-----|--------------------------|-----------|-----|------------------|
| A) Electroless nickel | X | <input type="checkbox"/> | | | |
| B) Electroplated nickel | X | <input type="checkbox"/> | | | |

| 3.14 GOLD SURFACE PLATING | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|---------------------------|-----|--------------------------|-----------|-----|------------------|
| A) Electroless gold | X | <input type="checkbox"/> | | | |
| B) Electroplated gold | X | <input type="checkbox"/> | | | |

| 3.15 PALLADIUM SURFACE PLATING | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--------------------------------------|-----|--------------------------|-----------|-----|------------------|
| A) Electroless palladium (immersion) | X | <input type="checkbox"/> | | | |
| B) Electroplated palladium | X | <input type="checkbox"/> | | | |

| 3.16 SOLDERMASK | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--------------------------------|--------------------------|--------------------------|-----------|-----|------------------|
| A) Screened deposited image | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| B) Dry film photoimageable | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| C) Liquid photoimageable | X | <input type="checkbox"/> | | | |
| D) Dry film/liquid combination | <input type="checkbox"/> | <input type="checkbox"/> | | | |

| 3.17 ORGANIC SURFACE PROTECTION | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|---------------------------------|--------------------------|--------------------------|-----------|-----|------------------|
| A) Benzotriazole | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| B) Imidazole | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| C) Benzimidazole | X | <input type="checkbox"/> | | | |

| 3.18 MICROSECTION CAPABILITY | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|-------------------------------|--------------------------|--------------------------|-----------|-----|------------------|
| A) Manual | X | <input type="checkbox"/> | | | |
| B) Single cavity automated | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| C) Multiple cavity automated | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| D) Plating thickness analysis | X | <input type="checkbox"/> | | | |

| 3.19 CHEMICAL ANALYSIS | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|----------------------------|-----|--------------------------|-----------|-----|------------------|
| A) Etching chemistry | X | <input type="checkbox"/> | | | |
| B) Plating chemistry | X | <input type="checkbox"/> | | | |
| C) Effluent (PPM) analysis | X | <input type="checkbox"/> | | | |

| 3.20 ELECTRICAL TEST EQUIPMENT | YES | NO | EQUIPMENT | QTY | EQUIPMENT LIMITS |
|--------------------------------|-----|--------------------------|-----------|-----|------------------|
| A) Continuity and shorts | X | <input type="checkbox"/> | | | |
| B) Fixture development | X | <input type="checkbox"/> | | | |
| C) Flying probe test | X | <input type="checkbox"/> | | | |
| D) Impedance control | X | <input type="checkbox"/> | | | |

MASTER EQUIPMENT LISTING

FORM MQP 10

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

Please complete a Master Equipment List. You may use your own form or the MQP Form 10.

| IDENTIFICATION | EQUIPMENT NAME/DESCRIPTION | MANUFACTURER TYPE/MODEL | EQUIPMENT LIMITS | ACCURACY | CALIBRATION FREQUENCY | REMARKS |
|-----------------------|----------------------------|-------------------------|------------------|----------|-----------------------|---------|
| Supplied upon request | | | | | | |
| | | | | | | |
| | | | | | | |
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SECTION 4

TECHNOLOGY PROFILE SPECIFICS

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

4.1 ADMINISTRATION

| 4.1.1 CAPACITY PROFILE | EST % | COMMENTS |
|--|---------|------------------------------------|
| A) Total annual capacity in square meters (surface area) per month | 293KSQ' | Based on 375 18* 24 panels per day |
| B) Presently running at ____ % of capacity | 60 | |

| 4.1.2 PERCENTAGE OF DOLLAR VOLUME | EST % | COMMENTS |
|-------------------------------------|-------|----------|
| A) Single sided (rigid) | 2 | |
| B) Double sided (rigid) | 40 | |
| C) Multilayer (rigid) | 58 | |
| D) Single side (unreinforced-flex) | N/A | |
| E) Double sided (unreinforced-flex) | N/A | |
| F) Multilayer (unreinforced-flex) | N/A | |
| G) Multilayer (rigid/flex) | N/A | |

| 4.1.3 PANEL PRODUCTION PROFILE | UNITS PER MONTH |
|---------------------------------------|-----------------|
| A) Size of a production lot in panels | |
| 1) Normal | 17-20 panels |
| 2) Smallest | 1-2 panels |
| B) Number of panels per month | |
| 1) High Production | |
| 2) Medium Production | |
| 3) Low Production | |
| 3) Short run | |
| 4) Prototype | |

| | | | |
|--|--------------------------|--------------------------|----------------------|
| C) Average lead time (delivery) as defined in B) | | | |
| 1) High Production | 4-6 weeks | | |
| 2) Medium Production | 2-3 weeks | | |
| 3) Low Production | 2 weeks | | |
| 3) Short run | 1-2 days | | |
| 4) Prototype | 3-5 days | | |
| Quick turn - No. of days <u>3 & 5.</u> | | | |
| D) Product delivered in full panel or array sub-panel format | | | |
| 1) Total in panel or array format | 35% array or pallet | | |
| 2) Scored format | 50% | | |
| 3) Tab breakaway format | 50% | | |
| 4) Other | N/A | | |
| 5) Total to customer layout | 75% | | |
| 6) Total to manufacturing layout | 25% | | |
| E) Product delivered in board format | | | |
| 1) Total in board format | 65% | | |
| 2) Extracted: scored to size | 0 | | |
| 3) Extracted: sheared to size | 0 | | |
| 4) Extracted: routed to size | 100% | | |
| 4.1.4 APPROVAL AND CERTIFICATION | YES | NO | COMMENTS |
| A) Company approvals | | | |
| 1) UL approval | X | <input type="checkbox"/> | 94V Level <u>0</u> . |
| 2) Canadian standards | <input type="checkbox"/> | X | |
| 3) MIL-P-55110 | X | <input type="checkbox"/> | Compliant |
| 4) MIL-P-50884 | <input type="checkbox"/> | X | |
| 5) ISO-9002 | <input type="checkbox"/> | X | |
| 6) ISO-9001 | X | <input type="checkbox"/> | ISO9001-2000 |

| | | | |
|---|--------------------------|--------------------------|-----------------------|
| 7) ISO-14000 | <input type="checkbox"/> | X | |
| 8) BABT | <input type="checkbox"/> | X | |
| 9) EEC | <input type="checkbox"/> | X | |
| 10) Customer satisfaction | X | <input type="checkbox"/> | Customer survey 2X/yr |
| B) Other certification information | | | |
| 1)Laminate | X | <input type="checkbox"/> | C of C supplied |
| 2)Quality standards | X | <input type="checkbox"/> | IPC Class 3 |
| 3)Equipment calibration | X | <input type="checkbox"/> | NIST Traceable |

| 4.1.5 CUSTOMER INTERFACE PROFILE | YES | NO | COMMENTS |
|---|--------------------------|--------------------------|-----------------------------------|
| A) Modem capability | <input type="checkbox"/> | D | |
| B) Baud rate | | | N/A All E-mail |
| C) Data verification technique | X | <input type="checkbox"/> | Auto verification in CAM software |
| D) Engineering change order process | X | <input type="checkbox"/> | |
| E) Job status reporting to customers | X | <input type="checkbox"/> | Inside sales phone e-mail contact |

| 4.1.6 OTHER CAPABILITIES | YES | NO | COMMENTS |
|--|------------|--------------------------|---|
| A) Facility research and development | X | <input type="checkbox"/> | As performed by engineer and techs |
| B) (Automated) On-line shop floor control/MRP system | X | <input type="checkbox"/> | Automated WIP tracking and Quality system |
| C) Process control system | X | <input type="checkbox"/> | |
| D) Operator training system | X | <input type="checkbox"/> | |

4.2 PROCESS ORIENTATION

| 4.2.1 LAMINATE MATERIAL | EST % | COMMENTS |
|--|----------------------|--|
| A) Most commonly used laminates (G10, FR4, etc.) | 15 85 15 85 | Brand name ISOLA Type FR-4 MLB Brand name Ventek Type FR-4 MLB Brand name Shengyi Type FR-4 2/S Brand name Ventek Type FR-4 2/S |
| B) Other laminate material | 5 | King Bd |
| 1) Planar resistor layers | | UL approved <input type="checkbox"/> |
| 2) BT epoxy | | UL approved <input type="checkbox"/> |
| 3) Kevlar | | UL approved <input type="checkbox"/> |
| 4) Teflon | 100 | UL approved <input type="checkbox"/> Rogers 4350 Not UL approved |
| 5) Polyimide | | UL approved <input type="checkbox"/> |
| 6) Cyanate ester | | UL approved <input type="checkbox"/> |
| 7) Other | | UL approved <input type="checkbox"/> |
| C) Specification to which laminate is purchased (check all that apply) XMIL-P-13949 <input type="checkbox"/> IPC-4204 XIPC-4101 <input type="checkbox"/> UL Approved <input type="checkbox"/> IPC-4103 <input type="checkbox"/> Other <input type="checkbox"/> IPC-4202 <input type="checkbox"/> IPC-4203 | | |
| D) Laminate storage <input type="checkbox"/> Uncontrolled X Humidity controlled X Temperature controlled <input type="checkbox"/> Dry box X JIT inventory | | |
| E) Panel size configurations in X, Y dimensions maximum X <u>20</u> Y <u>24</u> mm minimum X <u>8</u> Y <u>9</u> mm other X _____ Y _____mm | | |

| 4.2.2 PROCESS PRECISION SPECIFICS | YES | NO | VALUE | COMMENTS |
|--|--------------------------|--------------------------|-------|---|
| A) Maximum printed board thickness built in volume | X | | .125 | |
| 1) Single sided | X | | .125 | |
| 2) Double sided | X | | .125 | |
| 3) Multilayer | X | | .125 | |
| 4) Rigid flex | | X | | |
| B) Printed board electrical performance capability | | | | |
| 1) Impedance control | X | <input type="checkbox"/> | +/-5% | |
| 2) Capacitance control | <input type="checkbox"/> | X | | |
| 3) Microstrip boards | X | <input type="checkbox"/> | | |
| C) Tooling system description | | | | |
| 1) Same holes in panels used for all processes | X | <input type="checkbox"/> | | Dedicated holes for primary image and LPI image |
| 2) Optical registration | X | <input type="checkbox"/> | | Process: Film and post etch punch |
| 3) Other | X | <input type="checkbox"/> | | Glass fram registration |

| 4.2.3 OTHER PROCESS ORIENTATION SPECIFICS | YES | NO | SYSTEM | COMMENTS |
|---|--------------------------|--------------------------|----------|---|
| A) Solder mask over bare copper | X | <input type="checkbox"/> | LPI | Spray coat, IR tack dry, Tunnel oven final bake |
| B) Plating/coating information | | | | |
| 1) Tin/lead reflow | <input type="checkbox"/> | X | | |
| 2) Hot air leveling | X | <input type="checkbox"/> | | |
| 3) Azole organic | X | <input type="checkbox"/> | | |
| 4) Conductive | X | <input type="checkbox"/> | | |
| C) Hole formation | | | | |
| 1) Hole cleaning | X | <input type="checkbox"/> | Chemical | |
| 2) Hole cleanliness verified | X | <input type="checkbox"/> | | |

4.3 PRODUCT DESCRIPTION

*CONSISTENCY IMPLIES YIELDS IN EXCESS OF 80%

| 4.3.1. THROUGH HOLE INSERTION | EST % | SIZE (MM) - +/- TOL | COMMENTS |
|--|-------|--|--------------|
| A) Smallest conductor width and tolerance produced with consistency | | | |
| 1) Outer layers (print and etch) | | Size <u>.004</u> mm Tol \pm <u>20%</u> .mm | |
| 2) Inner layers (print and etch) | | Size <u>.004</u> mm Tol \pm <u>20%</u> .mm | |
| 3) Outer layers (plated) | | Size <u>.004</u> mm Tol \pm <u>20%</u> .mm | |
| 4) Inner layers (plated) | | Size <u>.004</u> mm Tol \pm <u>20%</u> .mm | |
| 5) Outer layers (additive plating) | | Size _____ mm Tol \pm _____ .mm | |
| 6) Inner layers (additive plating) | | Size _____ mm Tol \pm _____ .mm | |
| B) Smallest plated-through hole (PTH) and tolerance consistently produced in 1.5mm thickness material or multilayer board | | | |
| 1) Minimum PTH diameter | | Size <u>.006</u> mm Tol \pm <u>.003</u> .mm | .008 Drilled |
| 2) Largest panel where this hole can be controlled (across diagonal) | | Size _____ mm Tol \pm _____ .mm | 20 * 24 |
| C) Largest hole size that can be drilled and plated through in a 1.25mm diameter land while maintaining an annular ring of 0.125mm in large/small boards | | | |
| 1) Largest board size (across diagonal) | | Size _____ mm | 20 * 24 |
| 2) Largest hole diameter | | Size <u>.250</u> mm | |
| 3) Smallest board size (across diagonal) | | Size _____ mm | 8 * 9 |
| 4) Largest hole diameter | | Size <u>.250</u> mm | |
| D) Surface mount land pattern pitch (check all that apply) | | | |
| X1.27mm [.050] X0.63mm [.025] | | | |
| X0.5mm [.020] X0.4mm [.016] | | | |
| <input type="checkbox"/> 0.3mm [.012] <input type="checkbox"/> 0.25mm [.010] | | | |
| <input type="checkbox"/> Other _____ . | | | |

| | | | |
|--|--|--|--|
| E) Solder mask dam between lands (check all that apply) X1.27mm [.050] X0.63mm [.025] X0.5mm [.020] X0.4mm [.016] X0.3mm [.012] X0.25mm [.010] XOther .003 . | | | |
| F) Flatness tolerance (bow & twist) after reflow or solder coating X1.5% <input type="checkbox"/> 1.0% <input type="checkbox"/> 0.5% <input type="checkbox"/> Other ____ | | | |

| 4.3.2 PRODUCT QUALITATIVE AND QUANTITATIVE INFORMATION | YES | NO | QUANTITY OF PANELS | NUMBER of DIMENSION | COMMENTS |
|---|--------------------------|--------------------------|--------------------|---------------------|----------|
| A) Multilayer layer count | | | | | |
| 1) Maximum layers fabricated in volume (Maximum Lot) | X | | 12 | | |
| 2) Maximum layers fabricated in prototype (Minimum Lot) | X | | 12 | | |
| B) Buried vias produced consistently in volume | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| 1) Size | | | | | |
| 2) Number of layers | | | | | |
| B) Blind vias produced consistently in volume | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| 1) Size | | | | | |
| 2) Number of layers | | | | | |
| 1) Controlled depth drilling | X | <input type="checkbox"/> | | | |
| 2) Total number of layers | 2 | | | | |

4.4. TESTING CAPABILITY

| 4.4.1 TEST AND TEST EQUIPMENT CAPABILITY | YES | NO | COMMENTS |
|--|--------------------------|--------------------------|---|
| A) SMT centerline pitch that can be electrically tested X 0.63mm [.025] X 0.5mm [.020]X X 0.4mm [.016] <input type="checkbox"/> 0.3mm [.012] <input type="checkbox"/> 0.25mm [.010] <input type="checkbox"/> Other | | | |
| B) Double sided simultaneous electrical testing | X | <input type="checkbox"/> | |
| 1) Equipment type | X | <input type="checkbox"/> | Evertt Charles-Clamshell Mania- LOC-8 Flying probe |
| 2) X-ray fluorescence inspection equipment | X | <input type="checkbox"/> | |
| 3) TDR equipment | <input type="checkbox"/> | X | |
| 4) Hi-pot test equipment | <input type="checkbox"/> | X | |
| 5) Four-wire kelvin tester | <input type="checkbox"/> | X | |

| | | | |
|------------------------|--------------------------|--------------------------|--|
| 6) Capacitance meter | <input type="checkbox"/> | X | |
| 7) Cleanliness testing | X | <input type="checkbox"/> | |

| 4.4.2 AUTOMATED OPTICAL INSPECTION USAGE | EST % | COMMENTS |
|--|-------|--|
| A) Before etching | Yes | |
| B) After etching | Yes | All .006 linear/space product or below |
| C) Internal layers | 100 | |
| D) Final inspection | | |
| E) Other | Yes | Photo tool or 1st piece as required |
| F) Conductor/clearance normally inspected by AOI equipment | | |
| 1) <input type="checkbox"/> 0.05mm [.002] | No | |
| 2) <input type="checkbox"/> 0.05-.10mm [.002-.004] | No | |
| 3) <input type="checkbox"/> >.10mm [.004] | Yes | 100% |
| 4) <input type="checkbox"/> Planes | Yes | 100% |
| G) CAD download to AOI | Yes | 100% |

SECTION 5

QUALITY PROFILE

| |
|-----------------------------|
| DATE COMPLETED 10-4-2010 |
|-----------------------------|

GENERAL INFORMATION

| | |
|--|-----------------------------|
| COMPANY NAME Triangle Circuits of Pgh | |
| CONTACT Frank Padol | |
| TELEPHONE NUMBER (412)828-5322 x635 | FAX NUMBER (412)828-5803 |

This section of the Manufacturer's Qualification Profile is intended to describe the Total Quality Management (TQM) activity in place of being implemented at the manufacturing facility identified in the site description of this MQP.

To ease in the task of identifying the TQM program being planned or underway at the manufacturing site, the activities have been divided into twenty sections which when completed, provide the total picture of the posture toward managing quality issues. Each section contains a number of questions with regard to the topic under review.

It is not the intent to have the questions be all encompassing, nor is every question applicable to all manufacturers. However, identification of the status, related to each questions, when considered as a whole will convey an impression of the progress that the company has achieved in adopting the principles of total quality management.

The twenty sections, in order of the occurrence are:

- | | |
|---------------------------------------|--|
| 5.1 General Quality Programs | 5.11 Statistical Process Control |
| 5.2 New Products/Technical Services | 5.12 Problem Solving |
| 5.3 Customer Satisfaction | 5.13 In-Process Control |
| 5.4 Computer Integrated Manufacturing | 5.14 Receiving Inspection |
| 5.5 Process Documentation | 5.15 Material Handling |
| 5.6 Quality Records | 5.16 Non-Conforming Material Control |
| 5.7 Skill, Training & Certification | 5.17 Inspection and Test Plan |
| 5.8 Subcontractor Control | 5.18 Product Inspection/Final Audit |
| 5.9 Calibration Control | 5.19 Tooling Inspection, Handling, & Storage |
| 5.10 Internal Audits | 5.20 Corrective Action |

Each section provides a status report related to each question. The question may not be applicable, no activity has started as yet, or the company may have developed an approach to the issues raised by the questions. An (X) is indicated in the appropriate column. If deployment/implementation has started, the status is reported as percent deployment; this is indicated in column 4. The percentage number closely approximates the status of deployment. If deployment exists, the percentage results that have been achieved is indicated in column 5. Results are based on expected goals. Not providing percent information in either the deployment or results column implies a lack of activity in the particular area.

The quality descriptions requested are completed on the following pages by checking (X) the appropriate column to reflect the status of the manufacturing facility TQM program. Additional information may be provided as comments shown below, or on individual sections, or additional sheets as necessary.

| COMMENTS |
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| 5.1 GENERAL QUALITY PROGRAMS | | STATUS | | | | |
|------------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are quality objectives and responsibilities clearly stated, widely distributed and understood through the company? | | | X | 100 | 100 |
| 2. | Is there a quality function or well defined organization which provides customer advocate guidance to the total organization and is this position fully supported by management? | | | X | 100 | 100 |
| 3. | Does a quality measurement system exist with clearly defined metrics and is it utilized as a management tool? | | | X | 100 | 100 |
| 4. | Are work instructions approved and controlled; and are they under revision control? | | | X | 100 | 100 |
| 5. | Are the quality procedures and policies current and available at the point of application; and are they under revision control? | | | X | 100 | 100 |
| 6. | Are benchmark and customer satisfaction studies done to determine best in class for all products, services, and administrative functions; and are quality goals set? | | | X | 100 | 100 |
| 7. | Are Statistical Process Control (SPC) principles understood by all levels of management? | | | X | 100 | 100 |
| 8. | Are there programs with sufficient resources assigned to support corrective actions and prevention? | | | X | 100 | 100 |
| 9. | Does management solicit and accept feedback from the work force? | | | X | 100 | 100 |
| 10. | Is there management support of ongoing training (including quality training), and is it documented by an organizational training plan? | | | X | 100 | 100 |
| 11. | Are there regular management reviews of elements of the quality improvement process, including feedback for corrective action, and are the results acted upon? | | | X | 100 | 100 |
| 12. | Are the quality and reliability goals aggressive relative to customer expectations and targeted at continuous improvement? | | | X | 100 | 100 |
| 13. | Are the people who are responsible for administering the quality assurance function technically informed? | | | X | 100 | 100 |
| 14. | Does Management have a "defect prevention" attitude to achieve continuous improvement? | | | X | 80 | 80 |

| 5.2 NEW PRODUCTS/TECHNICAL SERVICES | | STATUS | | | | |
|-------------------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Do new product/technology/service development policies and procedures exist, and do they result in clearly defined project plans with appropriate measureables and approvals? | | | X | 90 | 90 |
| 2. | Is quantitative benchmarking used to evaluate all new products/technologies/services in comparison to best-in-class offerings? | | | X | 80 | 80 |
| 3. | Does a roadmap exist to ensure continued development of leading edge, best-in-class products/technology/services? | | | X | 90 | 90 |
| 4. | Is the capability of each operation which controls critical-to-function characteristics for new products, fully certified? | | | X | 100 | 100 |
| 5. | Are statistical tools used in the development of robust (high yield) new processes, products, and services? | | | X | 80 | 80 |
| 6. | When new product/technology/service requires a new process, is it developed jointly and concurrently with the customer and/or suppliers? | | | X | 100 | 100 |
| 7. | Are design reviews conducted on a scheduled basis which properly address the process capability indices of critical-to-function and product/service characteristics? | | | X | 100 | 100 |
| 8. | Is the new product/technology/service, as produced by the process, verified to meet all customer satisfaction requirements? | | | X | 100 | 100 |

| COMMENTS |
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| 5.3 CUSTOMER SATISFACTION | | STATUS | | | | |
|---------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Is there a measurement system in place to assess the customer's perception of complete performance? | | | X | 100 | 100 |
| 2. | Is an independent (unbiased) customer survey routinely conducted? | | | X | 100 | 100 |
| 3. | Is there an internal measurement system within the organization which correlates to the level of customer satisfaction? | | | X | 90 | 90 |
| 4. | Are there specific goals for achieving Total Customer Satisfaction, both internal and external? | | | X | 100 | 95 |
| 5. | To what extent are customer satisfaction goals disseminated and understood by everyone in the organization? | | | X | 90 | 90 |
| 6. | Does management regularly review and assess all operating systems to determine if barriers to customer satisfaction exist and are appropriate action plans then implemented? | | | X | 100 | 100 |
| 7. | Is there a method in place to obtain future customer requirements? | | | X | 100 | 100 |
| 8. | Are all findings of customer dissatisfaction reported back to the proper organization for analysis and corrective action? | | | X | 100 | 100 |
| 9. | Are customer satisfaction requirements formally defined and documented, and are they based on customer input? | | | X | 100 | 100 |
| 10. | Do all support organizations understand their role in achieving total customer satisfaction? | | | X | 90 | 90 |

| 5.4 COMPUTER INTEGRATED MANUFACTURING | | STATUS | | | | |
|---------------------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are systems integrated to allow electronic transfer of information between multiple systems to eliminate redundant data entry? | | | X | 100 | 100 |
| 2. | Can customers electronically transfer CAD/CAM directly into manufacturing? | | | X | 100 | 100 |
| 3. | Can customers electronically transfer order information directly into the business system? | X | | | | |
| 4. | Is data electronically shared between shop floor control and process control systems (i.e., CNC, SPC, Electrical Test, AOI, etc.)? | | | X | 100 | 100 |
| 5. | Are planning systems (MRP, forecasting, capacity planning, financial planning, etc.) electronically integrated with operation systems (order processing, purchasing, inventory management, shop floor control, financial/cost control, etc.)? | | | X | 100 | 100 |
| 6. | Is information available from system processes in real time (vs. batch processing)? | | | X | 100 | 100 |
| 7. | Are processes and procedures documented and available on-line? | X | | | | |
| 8. | Do all functional departments have system access to key financial, manufacturing, sales, and operational data, as it relates to their functional objectives? | | | X | 100 | 100 |
| 9. | Are computer simulation and design tools used to the maximum extent practicable in the design of new products/technologies/services | | | X | 100 | 100 |

| COMMENTS | | | | | | |
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| 5.5 PROCESS DOCUMENTATION | | STATUS | | | | |
|---------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are manufacturing product, process, and configuration documents under issue control? | | | X | 100 | 100 |
| 2. | Are "preliminary" and "special product" specifications controlled? | | | X | 100 | 100 |
| 3. | Does the system ensure that the most current customer specifications are available to the manufacturing personnel? | | | X | 100 | 100 |
| 4. | Does the system ensure that the most current material specifications are available to the procurement function? | | | X | 100 | 100 |
| 5. | Are incoming orders reviewed for revisions and issue changes? | | | X | 100 | 100 |
| 6. | Is conformance to customer specifications assured before an order is accepted? | | | X | 100 | 100 |
| 7. | Is customer feedback provided when designs do not meet manufacturability requirements? | | | X | 100 | 100 |
| 8. | Are critical characteristics classified, relative to impact on product performance? | | | X | 100 | 100 |
| 9. | Are customers informed of changes made to products controlled by customer drawings or specifications? | | | X | 100 | 100 |
| 10. | Is there an effective internal deviation control procedure and, are customer requested deviations documented and followed? | | | X | 100 | 100 |
| 11. | Do new product development procedures exist, and are they followed in the design development process? | | | X | 100 | 100 |

| 5.6 QUALITY RECORDS | | STATUS | | | | |
|------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are records of inspection and process control maintained and available for review? | | | X | 100 | 100 |
| 2. | Are records of equipment and equipment maintenance kept? | | | X | 100 | 100 |
| 3. | Is the record and sample retention program defined? | | | X | 100 | 100 |
| 4. | Are quality data used as a basis for corrective action? | | | X | 100 | 100 |
| 5. | Are quality data used in reporting performance and trends to management? | | | X | 100 | 100 |
| 6. | Are quality data used in supporting certifications of quality furnished to customers? | | | X | 100 | 100 |
| 7. | Is field information used for corrective action? | | | X | 100 | 100 |
| 8. | Does a cost of quality measurement system exist? | | | X | 90 | 90 |
| 9. | Are customer reported quality problems responded to, and resolved in the time period requested? | | | X | 100 | 100 |
| 10. | Is quality information on production material rejects provided to sub-suppliers with required corrective action? | | | X | 100 | 100 |
| 11. | Are computers used to collect and analyze quality data? | | | X | 100 | 100 |

COMMENTS

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| 5.7 SKILLS, TRAINING, & CERTIFICATION | | STATUS | | | | |
|---------------------------------------|--|--------|--|--|--|--|
|---------------------------------------|--|--------|--|--|--|--|

| DESCRIPTION OF PROGRAM | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
|------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| 1. | Does management ensure that all personnel are trained in their role for achieving Total Customer Satisfaction? | | | X | 100 | 100 |
| 2. | Do all personnel understand how their performance impacts internal and external customer satisfaction? | | | X | 100 | 100 |
| 3. | Do all personnel who contact external customers reflect quality improvement programs? | | | X | 100 | 100 |
| 4. | Do personnel participate in professional societies and growth programs? | | | X | 100 | 100 |
| 5. | Are all personnel trained in sufficient detail to support key initiatives? | | | X | 100 | 100 |
| 6. | Are the results of training evaluated and indicated program changes made? | | | X | 100 | 100 |
| 7. | Does a policy exist which encourages the cross training and rotation of personnel, and is this policy used as the basis of job progression? | | | X | 100 | 100 |
| 8. | Are performance standards participatively developed, and regularly applied for all personnel? | | | X | 100 | 100 |
| 9. | Are Total Customer Satisfaction programs and resulting successes publicized to all personnel? | | | X | 100 | 100 |
| 10. | Do goal setting and reward/incentive programs support the quality improvement process? | | | X | 100 | 100 |

| 5.8 SUBCONTRACTOR CONTROL | | STATUS | | | | |
|---------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| DESCRIPTION OF PROGRAM | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| 1. | Are requirements defined, communicated, and updated to ensure that the supplier understands expectations? | | | X | 100 | 100 |
| 2. | Does a system exist which measures the performance of the supplier and communicates such information to the supplier? (i.e., supplier rating system) | | | X | 100 | 100 |
| 3. | Have the organization's processes been characterized to identify the critical requirements for the suppliers products? | | | X | 100 | 100 |
| 4. | Have the capabilities of the supplier's processes been assessed and considered in the establishment of the requirements? | | | X | 100 | 100 |
| 5. | Have partnerships been established with suppliers, and is assistance provided to ensure that each supplier has the capability to consistently supply conforming products? | | | X | 100 | 100 |
| 6. | Have quality and cycle time metrics and improvement goals been established participatively with the supplier? | | | X | 100 | 100 |
| 7. | Has a system been established with the supplier for identification and verification of corrective action? | | | X | 100 | 100 |
| 8. | Have the requirements for supplier materials been properly characterized and specified to ensure conformance of the product/service to the customer satisfaction requirements? | | | X | 100 | 100 |
| 9. | Is there a supplier certification program or equivalent procured material/service continuous quality improvement program? | | | X | 100 | 75 |
| 10. | Can all personnel who contract suppliers properly reflect appropriate quality improvement programs and status to them? | | | X | 100 | 100 |

| COMMENTS |
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| 5.9 CALIBRATION CONTROL | | STATUS | | | | |
|-------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| DESCRIPTION OF PROGRAM | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
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|-----|---|--|--|---|-----|-----|
| 1. | Are calibration and preventative maintenance programs in place and documented? | | | X | 100 | 100 |
| 2. | Are calibration and maintenance personnel trained? | | | X | 100 | 100 |
| 3. | Is traceability to NIST maintained? | | | X | 100 | 100 |
| 4. | Is quality measurement and control equipment current, effective, and sufficiently integrated with production equipment? | | | X | 100 | 100 |
| 5. | Is the history of quality measurement and control equipment documented? | | | X | 100 | 100 |
| 6. | Has repeatability of measuring devices and inspection or testing processes been established and monitored; are gauge capability studies conducted and GR&R ratios acceptable(<10%)? | | | X | 100 | 100 |
| 7. | Are calibration and preventative maintenance cycles on schedule? | | | X | 100 | 100 |
| 8. | Is the use of non-calibrated equipment for design and production purposes prohibited? | | | X | 100 | 100 |
| 9. | Are tools and fixtures used as criteria or acceptability of product/work fully qualified and identified? | | | X | 100 | 100 |
| 10. | Are calibration intervals defined in accordance with industry standards or manufacturer's recommendations and the calibration history of the equipment? | | | X | 100 | 100 |

| 5.10 INTERNAL AUDITS | | STATUS | | | | |
|------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| 1. | Are regular reviews of the product/process conducted and are goals/plans established to continually improve? | | | X | 100 | 100 |
| 2. | Are the processes/products properly documented and controlled? Do they include appropriate customer requirements and are they executed in conformance to the documentation? | | | X | 100 | 100 |
| 3. | Are the required quality checks built into the operations within the manufacturing, field installation, and service process, and is the resulting data maintained and promptly acted upon? | | | X | 100 | 100 |
| 4. | Are all pertinent methods of statistical quality control properly, effectively and efficiently used? | | | X | 100 | 100 |
| 5. | Does a process change control system exist, and are customers informed of changes made to products and processes with customer approval prior to the change, when required? | | | X | 100 | 100 |
| 6. | Are the operators within the process provided with written work instructions and are they trained? | | | X | 100 | 100 |
| 7. | Is the receipt, handling, storage, packaging and release of all material, including customer provided items, at all stages, specified and controlled to prevent damage or deterioration, and to address obsolete material? | | | X | 100 | 100 |
| 8. | Is there a first in/first out (FIFO) system in place, and is it followed? | | | X | 100 | 100 |

| COMMENTS |
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| 5.11 STATISTICAL PROCESS CONTROL | | STATUS | | | | |
|----------------------------------|--|------------------------|-------------|--------------------|------------------|-----------------|
| | | DESCRIPTION OF PROGRAM | | | | |
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| 1. | Have the personnel who will be responsible for guiding the implementation of SPC been designated? | | | X | 100 | 100 |
| 2. | Are statistical techniques used to reduce variation in the engineering process before the start of production? | | | X | 100 | 100 |
| 3. | Is the quality system dependent upon process rather than product controls? | | | X | 100 | 100 |
| 4. | Is the capability of critical processes and machines measured and monitored with CPK's >1.5, and targeted with CP of 2.0? | | | X | 100 | 100 |
| 5. | Are incapable processes or machines targeted for improvement or replacement? | | | X | 100 | 100 |
| 6. | Is SPC implemented for all critical processes? | | | X | 100 | 100 |
| 7. | Are procedures that control the reaction to out-of-control situations adequate and effective? | | | X | 100 | 100 |
| 8. | Are operators trained in the use of appropriate statistical techniques, and are they properly applying them? | | | X | 75 | 75 |
| 9. | Are advanced problem solving techniques used by engineers to solve problems? (Design of Experiments, planned experimentation, advanced diagnostic tools, etc.) | | | X | 50 | 50 |
| 10. | Are control charts and other process controls properly implemented? | | | X | 100 | 100 |
| 11. | Is statistical process control being practiced in work centers and are yields being recorded and plotted on a scheduled basis, with respect to upper and lower control limits? | | | X | 90 | 90 |

| 5.12 PROBLEM SOLVING | | STATUS | | | | |
|----------------------|---|------------------------|-------------|--------------------|------------------|-----------------|
| | | DESCRIPTION OF PROGRAM | | | | |
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| 1. | Are employees trained in problem solving techniques, in comparison to the needs of the organization? | | | X | 50 | 50 |
| 2. | Does the organization utilize participative problem solving techniques to identify, measure and resolve internal and external problems? | | | X | 100 | 100 |
| 3. | Are problem solving efforts timely and effective? | | | X | 100 | 100 |
| 4. | Are applied resources sufficient to remove problem solving constraints? | | | X | 100 | 100 |
| 5. | Are statistical techniques used for problem solving? | | | X | 100 | 100 |
| 6. | Are quality data used to identify barriers, and to determine the priority of problems? | | | X | 90 | 90 |
| 7. | Is there a policy/procedure that includes the use of problem solving techniques to systematically drive reduction in variability? | | | X | 100 | 100 |

| COMMENTS | | | | | | |
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| 5.13 IN-PROCESS CONTROL | | STATUS | | | | |
|-------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are process capabilities established and maintained on all major processes? (critical parameters) | | | X | 100 | 100 |
| 2. | Are in-process inspections, test operations, and processes properly specified and performed? | | | X | 100 | 100 |
| 3. | Are in-process inspection facilities and equipment adequate? | | | X | 100 | 100 |
| 4. | Are the results of in-process inspections used in the promotion of effective preventative action and corrective action? | | | X | 100 | 100 |
| 5. | Is preventative maintenance performed on the equipment and facilities? | | | X | 100 | 100 |
| 6. | Are housekeeping procedures adequate and how well are they followed? | | | X | 100 | 100 |
| 7. | Are process management plans established, and are critical parameters followed? | | | X | 100 | 100 |
| 8. | Are work areas uncluttered and free of excess work-in-process, supplies, debris, etc? Is the environment conducive to producing quality work? Is proprietary information adequately protected? | | | X | 100 | 100 |
| 9. | Are certifications and in-process inspection results used in making final acceptance decisions? | | | X | 100 | 100 |
| 10. | Are methods and procedures for the control of metallurgical, chemical, and other special processes established and followed? | | | X | 100 | 100 |

| 5.14 RECEIVING INSPECTION | | STATUS | | | | |
|---------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are receiving inspection facilities and equipment adequately and properly maintained? | | | X | 100 | 100 |
| 2. | Are receiving inspection procedures documented and followed? | | | X | 100 | 100 |
| 3. | Are receiving inspection results used for corrective and preventive action? | | | X | 100 | 100 |
| 4. | Are the procedures for storage and timely disposition of discrepant material in place and followed? | | | X | 100 | 100 |

| COMMENTS |
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| 5.15 MATERIAL HANDLING | | STATUS | | | | |
|------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are procured material releases from receiving inspection clearly identified, as to acceptance status? | | | X | 100 | 100 |
| 2. | Are procedures to facilitate limited life materials, such as prepreg, in place, properly controlled, and monitored? | | | X | 100 | 100 |
| 3. | Are procured items identified with some means of traceability (serial number, lot number, date code, etc.)? | | | X | 100 | 100 |
| 4. | Are procedures and facilities adequate for storage, release and control of materials? | | | X | 100 | 100 |
| 5. | Are in-store and in-process materials properly identified and controlled? | | | X | 100 | 100 |
| 6. | Is in-process material protected from corrosion, deterioration, and damage? | | | X | 100 | 100 |

| 5.16 NON-CONFORMING MATERIAL CONTROL | | STATUS | | | | |
|--------------------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Is non-conforming material identified, segregated from regular production material, and properly dispositioned? | | | X | 100 | 100 |
| 2. | Are non-conforming materials properly identified and controlled to prevent inadvertent use? | | | X | 100 | 100 |
| 3. | Is the review and disposition of non-conforming materials defined, and are provisions made for inclusion of the customer in disposition decision? | | | X | 100 | 100 |
| 4. | Are procedures for controlling non-conforming materials, and for ensuing corrective action, in place and followed? | | | X | 100 | 100 |
| 5. | Do procedures provide for material review by a committee consisting of Quality and Engineering (as a minimum), to determine the disposition of non-conforming materials? (deviating from drawings or specification) | | | X | 100 | 100 |
| 6. | Do supplier's procedures and controls for corrective action prevent recurrence of non-conformances? | | | X | 100 | 100 |
| 7. | Is there a system for coordinating necessary corrective action with purchasing personnel? | | | X | 100 | 100 |
| 8. | Does the corrective action extend to all applicable causes of non-conformance (e.g., design, workmanship, procedures, equipment, etc.)? | | | X | 100 | 100 |

| COMMENTS |
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| 5.17 INSPECTION AND TEST PLAN | | STATUS | | | | |
|-------------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are statistical techniques used in determining the acceptability of finished goods to customer requirements? | | | X | 100 | 100 |
| 2. | Are periodic tests conducted to audit reliability and environmental performance of the final product? | | | X | 100 | 100 |
| 3. | Is CPK tracking performed for critical characteristics, with plans to achieve CPK = 1.5 with a target of CP of 2.0? | | | X | 70 | 70 |
| 4. | Is root cause failure analysis performed for internal and external failures, and is appropriate corrective action implemented? | | | X | 100 | 100 |
| 5. | Are test and inspection personnel trained in the procedures of their operations, and are those procedures being followed? | | | X | 100 | 100 |
| 6. | Is the new product/technology/service, as produced by the processes, verified to meet all customer satisfaction requirements? | | | X | 100 | 100 |

| 5.18 PRODUCT INSPECTION/FINAL AUDIT | | STATUS | | | | |
|-------------------------------------|--|----------------|-------------|--------------------|------------------|-----------------|
| | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| DESCRIPTION OF PROGRAM | | | | | | |
| 1. | Are final product acceptance procedures documented and followed? | | | X | 100 | 100 |
| 2. | Are all specific customer product audits conducted, as required? | | | X | 100 | 100 |
| 3. | Are inspectors trained for the tasks performed? | | | X | 100 | 100 |
| 4. | Are flow charts or milestones developed with checkpoints readily available? | | | X | 100 | 100 |
| 5. | Is a system in place which denotes inspection performed; e.g., use of initials, stamps, labels, bar codes, etc., affixed to production documentation? | | | X | 100 | 100 |
| 6. | Is a quality system established and maintained for control of product/production documentation? | | | X | 100 | 100 |
| 7. | Is "accept/reject" criteria defined and available for use? | | | X | 100 | 100 |
| 8. | Is a final audit performed to ensure that all required verifications and tests, from receipt of materials through point of product completion, have been accomplished? | | | X | 100 | 100 |
| 9. | Are packing and order checking procedures documented and followed? | | | X | 100 | 100 |

| COMMENTS | | | | | | |
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| 5.19 TOOLING INSPECTION, HANDLING, & | | STATUS | | | | |
|--------------------------------------|--|--------|--|--|--|--|
|--------------------------------------|--|--------|--|--|--|--|

| STORAGE | | | | | | |
|-------------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| DESCRIPTION OF PROGRAM | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| 1. | Are temperature, humidity, laminar flow controls in place to prevent contamination, and to assure dimensional stability? | | | X | 100 | 100 |
| 2. | Do operators use hairnets, gloves & lab coats in all photolab and photoexposure areas? | | | X | 95 | 100 |
| 3. | Are work instructions and related forms in place to control all applicable tooling requirements, as stated in the customer's purchase order? | | | X | 100 | 100 |
| 4. | Are customer provided artworks controlled with regard to handling, storage, revision control and relationship to converted production phototools (working films)? | | | X | 100 | 100 |
| 5. | Are production phototools (working films) controlled with regard to handling, storage, use life, and relationship to customer purchase order? | | | X | 100 | 100 |
| 6. | Are customer provided artworks and production phototools (working films) inspected, including dimensional checks? | | | X | 100 | 100 |
| 7. | Are all tools, fixtures, and other devices, used for tooling inspection and control, maintained under the calibration control procedure? | | | X | 100 | 100 |
| 8. | Are records showing initial acceptance, periodic checks, and any needs for rework and/or modification available? | | | X | 100 | 100 |

| 5.20 CORRECTIVE ACTION | | STATUS | | | | |
|-------------------------------|---|----------------|-------------|--------------------|------------------|-----------------|
| DESCRIPTION OF PROGRAM | | Not Applicable | Not Started | Approach Developed | Percent Deployed | Percent Results |
| 1. | Are final acceptance inspection results used for corrective and preventative action? | | | X | 100 | 100 |
| 2. | Is root-cause analysis performed for non-conformances? This includes, but is not limited to, non-conformances (problems) caused by suppliers, found/caused "in-house" during processing, or those reported by the customer. | | | X | 100 | 100 |
| 3. | Is positive action taken to prevent recurrence of problems, and are there documented reports/records of each occasion? | | | X | 100 | 100 |
| 4. | Do procedures and systems provide for ensuring that replies are made to customer requests for correction action within the time limit specified? | | | X | 100 | 100 |
| 5. | Is corrective action controlled and documented for all applicable work centers? | | | X | 100 | 100 |
| 6. | When corrections are made, is their effectiveness subsequently reviewed and monitored? | | | X | 100 | 100 |

| COMMENTS | |
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SECTION 6 (CHECK ONE IN EACH LINE THAT APPLIES)

MANUFACTURING HISTORY (See Section 2 Site Capability)

DATE COMPLETED
Available upon
request

Please complete as many history profiles so that the total descriptions of products you manufacture account for production orders that reflect 70% of your business. History profiles are for board or board family (board types may be grounded together if they are similar).

| | | | |
|------------|---------------------|---------------------------|-----------|
| BOARD TYPE | DATE OF ORDER | MATERIAL | HISTORY # |
| VIA TYPE | PRODUCTION QUANTITY | TOTAL YEARLY PRODUCTION % | |

Dimensions in millimeters (inches in brackets)

| BOARD | | | HOLES | | |
|--|---|--|---|---|--|
| BOARD SIZE DIAGONAL | TOTAL BOARD THICKNESS | NUMBER CONDUCTIVE LAYERS | DIA DRILLED HOLES | TOTAL PTH TOL (MAX-MIN) | LOCATION TOL DTP |
| <input type="checkbox"/> <250 [<10.00] | <input type="checkbox"/> <1,0 [$<.040$] | <input type="checkbox"/> 1-4 [1-4] | <input type="checkbox"/> >0,5 [$>.020$] | <input type="checkbox"/> >0,250 [$>.010$] | <input type="checkbox"/> >0,50 [$>.020$] |
| <input type="checkbox"/> 250 [10.00] | <input type="checkbox"/> 1,0 [.040] | <input type="checkbox"/> 5-6 [5-6] | <input type="checkbox"/> 0,5 [.020] | <input type="checkbox"/> 0,250 [.010] | <input type="checkbox"/> 0,50 [.020] |
| <input type="checkbox"/> 350 [14.00] | <input type="checkbox"/> 1,6 [.060] | <input type="checkbox"/> 7-8 [7-8] | <input type="checkbox"/> 0,4 [.016] | <input type="checkbox"/> 0,200 [.008] | <input type="checkbox"/> 0,40 [.016] |
| <input type="checkbox"/> 450 [17.50] | <input type="checkbox"/> 2,0 [.080] | <input type="checkbox"/> 9-12 [9-12] | <input type="checkbox"/> 0,35 [.014] | <input type="checkbox"/> 0,150 [.006] | <input type="checkbox"/> 0,30 [.012] |
| <input type="checkbox"/> 550 [21.50] | <input type="checkbox"/> 2,5 [.100] | <input type="checkbox"/> 13-16 [13-16] | <input type="checkbox"/> 0,30 [.012] | <input type="checkbox"/> 0,125 [.005] | <input type="checkbox"/> 0,25 [.010] |
| <input type="checkbox"/> 650 [25.50] | <input type="checkbox"/> 3,5 [.135] | <input type="checkbox"/> 17-20 [17-20] | <input type="checkbox"/> 0,25 [.010] | <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,20 [.008] |
| <input type="checkbox"/> 750 [29.50] | <input type="checkbox"/> 5,0 [.200] | <input type="checkbox"/> 21-24 [21-24] | <input type="checkbox"/> 0,20 [.008] | <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,15 [.006] |
| <input type="checkbox"/> 850 [33.50] | <input type="checkbox"/> 6,5 [.250] | <input type="checkbox"/> 25-28 [25-28] | <input type="checkbox"/> 0,15 [.006] | <input type="checkbox"/> 0,050 [.002] | <input type="checkbox"/> 0,10 [.004] |
| <input type="checkbox"/> >850 [>33.50] | <input type="checkbox"/> >6,5 [$>.250$] | <input type="checkbox"/> >28 [>28] | <input type="checkbox"/> <0,15 [.006] | <input type="checkbox"/> <0,050 [$<.002$] | <input type="checkbox"/> <0,10 [$<.004$] |
| <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: |

CONDUCTORS

| INTERNAL ELEC CLEARANCE (MIN) | INTERNAL COND WIDTH (MIN) | INTERNAL PROCESS ALLOWANCE | EXTERNAL ELEC CLEARANCE (MIN) | EXTERNAL COND WIDTH (MIN) | EXTERNAL PROCESS ALLOWANCE | FEATURE LOCATION DTP |
|---|---|--|---|---|---|--|
| <input type="checkbox"/> >0,350 [$>.014$] | <input type="checkbox"/> >0,250 [$>.010$] | <input type="checkbox"/> >0,100 [$>.004$] | <input type="checkbox"/> >0,350 [$>.014$] | <input type="checkbox"/> >0,250 [$>.010$] | <input type="checkbox"/> >0,100 [$>.004$] | <input type="checkbox"/> >0,50 [$>.020$] |
| <input type="checkbox"/> 0,350 [.014] | <input type="checkbox"/> 0,250 [.010] | <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,350 [.014] | <input type="checkbox"/> 0,250 [.010] | <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,50 [.020] |
| <input type="checkbox"/> 0,250 [.010] | <input type="checkbox"/> 0,200 [.008] | <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,250 [.010] | <input type="checkbox"/> 0,200 [.008] | <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,40 [.016] |
| <input type="checkbox"/> 0,200 [.008] | <input type="checkbox"/> 0,150 [.006] | <input type="checkbox"/> 0,050 [.002] | <input type="checkbox"/> 0,200 [.008] | <input type="checkbox"/> 0,150 [.006] | <input type="checkbox"/> 0,050 [.002] | <input type="checkbox"/> 0,30 [.012] |
| <input type="checkbox"/> 0,150 [.005] | <input type="checkbox"/> 0,125 [.005] | <input type="checkbox"/> 0,040 [.0015] | <input type="checkbox"/> 0,150 [.006] | <input type="checkbox"/> 0,125 [.005] | <input type="checkbox"/> 0,040 [.0015] | <input type="checkbox"/> 0,25 [.010] |
| <input type="checkbox"/> 0,125 [.005] | <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,030 [.0012] | <input type="checkbox"/> 0,125 [.005] | <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,030 [.0012] | <input type="checkbox"/> 0,20 [.008] |
| <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,025 [.001] | <input type="checkbox"/> 0,100 [.004] | <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,025 [.001] | <input type="checkbox"/> 0,15 [.006] |
| <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,050 [.002] | <input type="checkbox"/> 0,020 [.0008] | <input type="checkbox"/> 0,075 [.003] | <input type="checkbox"/> 0,050 [.002] | <input type="checkbox"/> 0,020 [.0008] | <input type="checkbox"/> 0,10 [.004] |
| <input type="checkbox"/> <0,075 [$<.003$] | <input type="checkbox"/> <0,050 [$<.002$] | <input type="checkbox"/> <0,020 [$<.0008$] | <input type="checkbox"/> <0,075 [$<.003$] | <input type="checkbox"/> <0,050 [$<.002$] | <input type="checkbox"/> <0,020 [$<.008$] | <input type="checkbox"/> <0,10 [$<.004$] |
| <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: |

SECTION 7

| |
|--|
| DATE COMPLETED Available upon request |
|--|

IDENTIFICATION OF PREVIOUS AUDITS (Optional)

Please complete as many forms as you feel reflect the intensity of your customer visits.

| | |
|----------------------------------|------------------------------|
| COMPANY AUDITORS | DATE OF AUDIT |
| AUDIT TEAM MEMBERS | AUDITOR REMARKS |
| | SPECIFICATIONS USED IN AUDIT |
| LENGHT OF AUDIT | |
| TEAM MEMBERS MAY BE CONTACTED AT | |
| COMPANY AUDITORS | DATE OF AUDIT |
| AUDIT TEAM MEMBERS | AUDITOR REMARKS |
| | SPECIFICATIONS USED IN AUDIT |
| LENGHT OF AUDIT | |
| TEAM MEMBERS MAY BE CONTACTED AT | |
| COMPANY AUDITORS | DATE OF AUDIT |
| AUDIT TEAM MEMBERS | AUDITOR REMARKS |
| | SPECIFICATIONS USED IN AUDIT |
| LENGHT OF AUDIT | |
| TEAM MEMBERS MAY BE CONTACT AT | |

*REPEAT THIS FORM AS NECESSARY

SECTION 8

| |
|--|
| DATE COMPLETED Available upon request |
|--|

FINANCIAL REVIEW (OPTIONAL)

Please complete the following financial information that coincides with the company description and site information provided in section 1.

COMPANY FINANCIAL DESCRIPTION

| | | |
|-----------------------|----------------|----------------|
| LEGAL NAME | | |
| TAXPAYER ID NUMBER | DUNS NUMBER | TRADING SYMBOL |
| ANNUAL SALES | PRIOR YEAR | YEAR-TO-DATE |
| FISCAL YEAR | | |
| BANK | ACCOUNT NUMBER | |
| BANK ADDRESS | STATE | ZIP |
| PROVINCE | COUNTRY | |
| BANK TELEPHONE NUMBER | FAX NUMBER | |
| COMMENTS | | |

SITE FINANCIAL DESCRIPTION

| | | |
|-----------------------|----------------|----------------|
| SITE NAME | | |
| TAXPAYER ID NUMBER | DUNS NUMBER | TRADING SYMBOL |
| ANNUAL SALES | PRIOR YEAR | YEAR-TO-DATE |
| FISCAL YEAR | | |
| BANK | ACCOUNT NUMBER | |
| BANK ADDRESS | STATE | ZIP |
| PROVINCE | COUNTRY | |
| BANK TELEPHONE NUMBER | FAX NUMBER | |
| COMMENTS | | |

SECTION 9

MQP ELECTRONIC EDITING

This MS Word template comes with editable fields. IPC has made this electronic document available for ease of completing, updating, and filing the MQP, as well as to give the laminate manufacturer and customer a common interface. Using the template enables laminate manufacturers to maintain several customer specific files without the endless stream of paperwork.

Editable fields are highlighted in gray. To complete the fields in the template, use the TAB key to toggle from field to field, entering the information as instructed in the introductory text for each section.

The developers of this MQP strongly suggest the person at the laminate manufacturing facility responsible for creating and maintaining the MQP write protect the file to be sent.