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.

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

The IPC is indebted to the members of the OEM council who participated in the development of this document. A note of thanks is also expressed to the members of the IPC Presidents Council for their review and critique and construction recommendations in finalizing the principles developed for the MQP.

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CONTENTS

SECTION 1.1
COMPANY DESCRIPTION

DATE COMPLETED
06/15/15

GENERAL INFORMATION			
LEGAL NAME SAE Circuits Colorado, Inc.			
PHYSICAL ADDRESS 4820 N. 63rd Street, Suite 100			
CITY Boulder	STATE CO	ZIP 80301	
PROVINCE	COUNTRY USA		
TELEPHONE NUMBER 303-530-1900	FAX NUMBER 303-530-0210	TELEX NUMBER	
E-MAIL ADDRESS sales@saecircuits.com	MODEM NUMBER	DATE FOUNDED 1972 ☐ PUBLIC ☒ PRIVATE	
INTERNET URL www.saecircuits.com	FTP SITE ftp1.saecircuits.com (Call for login procedures)		

MANAGEMENT
PRESIDENT/CHAIRMAN Ben Yates
VICE PRESIDENT OF OPERATIONS Stephen Cecil
MANUFACTURING MANAGER David Denman
DIRECTOR OF QUALITY Gary Warner
DIRECTOR OF MARKETING/SALES Jack Jeffries
CUSTOMER SERVICE Maria Garcia & Spencer Hammen
WASTE TREATMENT MANAGER (POLLUTION PREVENTION) David Denman

CORPORATE DESCRIPTION		NUMBER OF EMPLOYEES CORPORATE	NUMBER OF EMPLOYEES SITE	COMMENTS
DESIGN AND DEVELOPMENT			0	
ENGINEERING			5	FOH
MANUFACTURING CONTROL			2	Production & Manufactruing Managers
MANUFACTURING	DIRECT		25	
	INDIRECT		6	EHS, Maintenance, Lab
QUALITY CONTROL	QUALITY INSPECTORS		4	
	INTERNAL AUDITORS		0	SUBCONTRACTED
	GENERAL MANAGEMENT		1	
ADMINISTRATION/SALES			6	
TOTAL			49	

SECTION 1.2
SITE DESCRIPTION

(TO BE COMPLETED FOR EACH SITE) DATE COMPLETED 06/15/2015 ATTACH APPROPRIATE CHARTS (OPTIONAL)

MANUFACTURING FACILITY

COMPANY NAME SAME		
PHYSICAL ADDRESS SAME		
CITY SAME	STATE SAME	ZIP SAME
PROVINCE	COUNTRY SAME	
TELEPHONE NUMBER SAME	FAX NUMBER SAME	TELEX
E-MAIL ADDRESS SAME	MODEM NUMBER SAME	YEARS IN BUSINESS 41
INTERNET URL SAME	FTP SAME	

PRINCIPLE PRODUCTS/SERVICES/SPECIALTIES	BUSINESS CHARACTERIZATION (HIGH VOLUME, QUICK TURN-AROUND, ETC.)
Printed Circuit Boards	Medium Volume with Quick Turn Capabilities

FACILITY MANAGEMENT	TITLE	REPORTS TO (Function/Job Title)
OVERALL OPERATION RESPONSIBILITY FOR THIS SITE Stephen Cecil	VP, Operations	Owner/Chairman
MANUFACTURING/TECHNICAL/ENGINEERING David Denman	Manufacturing Manager	VP, Operations
DIRECTOR OF MARKETING/SALES Jack Jeffries	National Sales Manager	VP, Operations
TECHNICAL SALES ENGINEER/QUOTER Stelios Androulidakis	Technical Sales Engineer/Quoter	National Sales Manager
PRODUCTION Dave Beal	Production Manager	Manufacturing Manager
QUALITY Gary Warner	Director, QA	VP, Operations
SALES REPRESENTATIVE Maria Garcia, Spencer Hammen	Inside Sales & Customer Service	National Sales Manager
WASTE MANAGEMENT Sergio Garcia	EHS Supervisor	Manufacturing Manager

BUILDINGS / SYSTEMS (INDICATE % COVERAGE)

	AGE	AREA (Sq. Ft.)	Construction (Wood/Brick)	Power Conditioning	Heating	Ventilation	Air Conditioning	Sprinklers	Waste Treatment	Other
Office		2500	Concrete	100	100	100	100	100	0	
Manufacturing		32000	Concrete	45	100	100	100	50	45	
Storage		1500	Concrete	0	100	100	100	0	0	
Planned additions										

SAFETY AND REGULATORY AGENCY REQUIREMENTS

Are fire extinguishers functional and accessible to employees?	☒ YES	☐ NO	What is the distance to the nearest fire station? (in minutes)	2 Minutes
Do you conform to local/federal environment protection agency requirements?	☒ YES	☐ NO	Date of last OSHA visit Date of last EPA visit	May 13, 2008 June 16, 2009
Are you currently operating under a waiver or in violation of local government requirements?	☐ YES	☒ NO	Other Agency Audits, UL, ISO 9000, NECQ, CSA Approval and Number	☒ UL # E44075 ☒ ISO 9001 # 04106711 ☐ CSA # ____ ☒ Other ITAR
Do you have a safety program? Describe below.	☒ YES	☐ NO	Hazardous Waste Number Trade Waste Account Number	COD 058158775 N/A

PLANT PERSONNEL (TOTAL EMPLOYEES)

Regular	Contract	Office	Technical/ Engineering	Production	Full-Time QA	Part-Time QA	Union	Non-Union	Union Name	Contract Expires (Date)
49	0	6	5	33	5	0	0	49		

COMMENTS

SECTION 2.1
PROCESS

DATE COMPLETED
06/15/15

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	☒Subtractive ☐Thin Foil Subtractive less than .5 oz. ☐Semi-Additive ☒Additive (Electro-less) ☐Black Hole ☐Thick Film Paste and Fire ☐Thin Film Semi-conductor Sputtering ☐Other:	
B	PTH Materials and Processes	☒Acid Copper ☐Pyro-Phosphate Copper ☐Full Built Electro-Less ☐Gold Paste ☐Copper Paste ☐Gold Conductor Sputtering ☐Nickel Conductor Sputtering ☐Other:	
C	Permanent Over-plating	☒Tin ☐Tin-Lead ☐Tin-Nickel Alloy ☒Nickel ☒Nickel Gold (Hard) ☒Nickel Gold (Soft) ☐Nickel Rhodium ☐Conductive Polymer ☒Other: Silver	ENIG (Reliavia™)

D	Permanent Selective Plating	☐Tin ☐Tin-Lead ☐Tin-Nickel Alloy ☒Nickel ☒Nickel Gold (Hard) ☒Nickel Gold (Soft) ☐Nickel Rhodium ☒Other: Silver	ENIG (Reliavia™)
E	Permanent Mask or Coating	☐Photo Dry Film ☒Photo Liquid ☐Image Transfer Screen Mask ☐Conformal Coating Solder Mask ☐Cover Coat ☐Other:	
F	Other Surface Finishes	☐Tin-Lead Fused ☒Immersion Tin ☒Solder Leveled ☐Roll Soldered ☐Electro-less Solder Fused ☐Solder Bumped Lands ☐Solder Paste Fused ☐Azole Organic Protective Covering ☐Flux Protective Covering ☒Other: Silver	Subcontracted

SECTION 2.2
ELECTRICAL TEST EQUIPMENT

DATE COMPLETED
06/15/15

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	☐<200 ☐200 ☐500 ☐1000 ☐2000 ☐3000 ☐4000 ☐5000 ☒>5000 ☐Other:	
B	Number of Nodes	☐<500 ☐500 ☐1000 ☐2000 ☐3000 ☐4000 ☐5000 ☐6000 ☒>6000 ☐Other:	
C	Probe Point Pitch	☐>1.0 [.040] ☐1.0 [.040] ☐0.8 [.032] ☐0.65 [.025] ☐0.50 [.020] ☒0.40 [.016] ☐0.30 [.012] ☐0.20 [.008] ☒<0.20 [.008] ☐Other:	FIXTURED TEST FLYING PROBE

D	Test % Single Pass	☐None ☐<60% ☐60% ☐70% ☐80% ☐90% ☐95% ☐99% ☒100% ☐Other:	
E	Probe Accuracy (DTP)	☐>0.2 [.008] ☐0.2 [.008] ☐0.15 [.006] ☐0.125 [.005] ☐0.1 [.004] ☒0.075 [.003] ☐<0.075 [.003] ☐Other:	
F	Grid Density	☒Single Side Grid ☒Double Sided Grid – SINGLE DENSITY ☐Double Density Grid ☐Double Density Double Sided ☐Quad Density ☐Double Sided Quad Density ☒Flying Probe ☐Other:	
G	Netlist Capability	☒Golden Board ☒IPC-D-356 ☒Net List Extraction ☒CAD/CAM Net List Compare ☐Other:	

H	Test Voltage	☐<20 VDC ☐20 VDC ☒40 VDC ☐60 VDC ☐80 VDC ☒100 VDC ☒500 VDC ☒1000 VDC ☐>1000 VDC ☒ Other: 250 VDC	
J	Impedance Meas	☒Micro Section ☐Inboard Circuit ☒Coupon ☒Manual TDR ☐Automated TDR ☐Other:	
K	Impedance Tolerance	☐None ☐>20% ☐20% ☐15% ☒10% ☐7% ☐5% ☐2% ☐<2% ☐Other:	

SECTION 2.3
PRODUCT TYPE

DATE COMPLETED
06/15/15

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	☒Rigid Printed Board ☐Flex Printed Board ☐Rigid/Flex Board ☒Rigid Back Plane ☐Molded Product ☒Ceramic Printed Board ☐Multichip Module ☐Liminated Multichip Module ☐Deposited Dielectric Multichip Modules ☐Other:	
B	Circuit Mounting Type	☒Single Sided ☒Double Sided ☒Multilayer ☐Single-sided Bonded to Substrate ☐Double-sided Bonded to Substrate ☒Multilayer Bonded to Substrate ☐Constrained Multilayer ☐Distributed Plane Multilayer ☒Other: Aluminum Substrate	24 Layers Maximum
C	Via Technology	☐No-Vias ☒Thru Hole Vias ☒Buried Vias ☒Blind Vias ☒Thru Hole & Blind Vias] ☒Thru Hole & Buried Vias ☒Thru Hole Buried & Blind Vias ☒Buried & Blind Vias ☐Other:	

D	Laminate Material	☒Phenolic ☐Epoxy Paper ☒Epoxy Glass ☐Modified Epoxy Composite ☐Polyimide Film & Reinforce ☐Cynanate Ester ☒Teflon ☒Ceramic Glass Types ☒Various Combinations ☒Other: ARLON & ROGERS RF MATL	
E	Core Material	☐No Core ☒Polymer ☒Copper ☒Aluminum ☐Graphite ☐Copper Invar/Copper ☐Copper Moly/Copper ☐Other:	
F	Copper Thickness (Oz.)	☐1/8 Minimum ☒1/4 Minimum ☒3/8 Minimum ☒1/2 Nominal ☒1 Nominal ☒2 Nominal ☒3-5 Max ☐6-9 Max ☐>10 ☐Other:	
G	Construction	☒≤4 Planes ☒>4 Planes ☒THK to TOL ≤0.2 mm ☐THK to TOL >0.2 mm ☒Bow/Twist ≤1% ☐Bow/Twist >1% ☒≤0.3 mm Profile Tolerance ☐0.3 mm Profile Tolerance ☐Other:	

H	Coatings and Markings	☒≤0.1 mm Mask Clearance ☐>0.1 mm Mask Clearance ☒One Side (Legend) ☒Two Side (Legend) ☒None (Legend) ☒UL Material Logo ☒U.L. V_0 Logo ☐U.L. V_1 Logo ☐U.L. V_2 Logo ☐ Other:	

SECTION 2.4
PRODUCT COMPLEXITY

DATE COMPLETED
06/15/15

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	☐<250 [10.00] ☐250 [10.00] ☐350 [14.00] ☐450[17.50] ☐550 [21.50] ☐650 [25.50] ☒750 [29.50] ☐850 [33.50] ☐>850 [33.50] ☐Other:	
B	Total Board Thickness	☐1,0 [.040] ☐1,0 [.040] ☐1,6 [.060] ☐2,0 [.080] ☐2,5 [.100] ☒3,5 [.135] ☒5,0 [.200] ☐6,5 [.250] ☐>6,5 [.250] ☐Other:	
C	Number Conductive Layers	☒1-4 ☒5-6 ☒7-8 ☒9-12 ☒13-16 ☒17-20 ☒21-24 ☐25-28 ☐>28 ☐Other:	24 LAYERS MAXIMUM

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

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

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

All Dimensions are in millimeters [inches shown in brackets]

SECTION 2.5
QUALITY DEVELOPMENT

DATE COMPLETED
06/15/15

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	☐Functional Steering Committee Formed ☒TQM Plan & Philosophy Established & Published ☐Documented Quality Progress Review ☐Implementation & review of Project Team Recommendations ☒TQM Communicated throughout organization ☒Controlled New process Start-up ☒Management Participates in TQM Audits ☐Employee Recognition Program ☐Total TQM Plan/Involvement Customer Training ☐Other:	
B	Employee Involvement	☐Certified Training Available ☒Training of Employee Base ☐TQM Team Trained ☐Design of Experiment Training and Use ☒New Process Implementation Training ☐Support Personnel Training ☐Advanced Statistical Training ☐Quality Functional Deployment ☒Ongoing Improvement Program for Employees ☐Other:	
C	Quality Manual	☐Quality Manual Started ☐Generic Quality Manual for Facility ☐10% of manufacturing depts. have process specifications ☐25% of manufacturing depts. have process specifications ☐50% of manufacturing depts. have process specifications ☐Non-manufacturing Manuals Developed ☐25% of all departments have quality manuals ☐50% of all departments have quality manuals ☒All Manufacturing and support depts. have controlled quality manal ☐Other:	

D	Instructions	☐Work Instructions Started ☐Quality Instructions Started ☐10% Work Instructions Completed ☐10% Quality Instructions Completed ☐25% Work Instructions Competed, Controlled ☐25% Quality Instructions Completed, Controlled ☐50% Work Instructions Completed, Controlled ☐50% Quality Instructions Completed, Controlled ☒Quality and work Instruct. Completed, Controlled ☐Other:	
E	SPC Implementation IPC-PC-90	☐Plan Exists ☐Training Started ☒Process Data Collected & Analyzed ☐All Employees Trained ☐First Process Stable & Capable ☐Several Major Processes Stable & Capable ☐Continued Improvement of Stable Processes ☐Additional Mfg Processes under Control ☐All Processes Under Control ☐Other:	
F	Supplier Programs/Controls	☐Supplier Rating Program ☐Monthly Analysis Program ☐Key Problems Identified ☐Supplier Reviews Performance Data provided ☐TQM Acceptance by suppliers ☐10% of Suppliers Using SPC ☐25% of Suppliers Using SPC ☐50% of Suppliers Using SPC ☒All Key Suppliers using Certified parts program ☐Other:	
G	Third Party IPC-QS-95	☐Instrument Controls in Place ☐Measurement System in Control IPC-PC-90 ☒Document Controls in Place ☐Reduced Lot Sampling ☐10% of Processes Under Audit Control ☐50% or Greater of Processes Under Audit Control ☐ISO-9003 Certified ☐ISO-9002 Certified ☒ISO-9001 ☐Other:	

SECTION 3

DATE COMPLETED
06/15/15

EQUIPMENT PROFILE (Pre-Site Audit)

* 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	☒	☐	Mania (Titan T8000)	1	
B) AOI CAD reference (CAM)	☒	☐	LAVENIR & GENESIS		
C) Photoplotting	☒	☐	BARCO	1	
D) Photo reductions	☒	☐			
E) Film scan and conversion	☒	☐			
F) Film processing ☐ air-dried ☐ force-dried ☒ processed in automatic processor	☒	☐	BARCO	1	
G) Media types ☒ silver halide film ☐ glass ☒ diazo	☒	☐			

3.2 DRILLING EQUIPMENT	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Manual	☐	☒			
B) Optical (single spindle)	☐	☒			
C) N.C. drill	☒	☐	EXCELLON MARK VI EXCELLON HVP	2 2	

3.3 ROUTING EQUIPMENT	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Edge beveler	☒	☐	BARNABY	1	
B) Hand router (pin router)	☐	☒			
C) N.C. router	☐	☒			
D) N.C. driller/router	☒	☐	EXCELLON MARK V	3	
E) Scoring (profile)	☐	☒			
F) Scoring (straight line)	☒	☐	ACCUSCORE AS-200-JM	1	JUMP SCORE CAPABILITIES

3.4 MECHANICAL EQUIPMENT	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Punch press	☐	☐			
B) Shear	☒	☐	PEXTO	1	
C) Milling machine	☐	☐			

3.5 HOLE PREPARATION (DESMEAR)	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Permagnate	☒	☐	IPS 6034	1	NEW FEB 2007
B) Plasma	☐	☒			
C) Mechanical	☐	☒			
D) Etchback	☐	☒			

3.6 PRIMARY IMAGE APPLICATION	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Dry film	☒	☐			
B) Hand screening	☐	☒			
C) Machine screening	☐	☒			
D) Wet film	☐	☒			
E) Liquid photoimageable	☐	☒			

3.7 TYPE OF TREATMENT FOR MULTILAYER INNERLAYERS	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Black oxide	☐	☒			
B) Red oxide	☐	☒			
C) Copper scrub	☐	☒			
D) Durabond	☐	☒			
E) Other	☒	☐	ORGANIC OXIDE REPLACEMENT	1	

3.8 LAMINATION	YES	NO	MATERIAL	QTY	APPLICATION TECHNIQUE
A) High pressure	☒	☐	TMP 26” X 30”	1	
B) High temperature	☒	☐	TMP	1	
C) Vacuum	☒	☐	TMP	1	
D) Vacuum assist	☒	☐	TMP	1	
E) Foil heat assist	☐	☒			
F) Separate cool-down	☒	☐	TMP RITE TEMP WATER CHILLER	1 1	

3.9 ELECTROLESS COPPER PLATING	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Fully additive application	☐	☒			
B) Electroless deposition (semiadditive)	☒	☐	IPS	1	
C) Through-hole and via	☒	☐	IPS	1	

3.10 COPPER ELECTROPLATING	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Copper sulfate	☒	☐	EIDSHUN	1	
B) Pyrophosphate	☐	☒			
C) Copper fluoborate	☐	☒			
D) Other	☐	☒			

3.11 TIN/LEAD SURFACE PLATINGS/COATINGS	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Tin/lead electroplated	☐	☒			
B) Immersion tin or tin/lead (electroless)	☒	☐			SUBCONTRACTED
C) Hot air solder leveled (HASL)	☒	☐	LANTRONIC TT30	1	VERTICAL

3.12 FUSING PROCESSES	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) I.R. reflow	☐	☒			
B) Hot oil reflow	☐	☒			
C) Horizontal (hot air level)	☐	☒			
D) Vertical (hot air level)	☒	☐	LANTRONIC TT30	1	VERTICAL

3.13 NICKEL SURFACE PLATING	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Electroless nickel	☒	☐	CUSTOM	1	
B) Electroplated nickel	☒	☐	SELREX TABMASTER	1	

3.14 GOLD SURFACE PLATING	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Immersion gold	☒	☐	CUSTOM	1	
B) Electroplated gold	☒	☐	SELREX TABMASTER	1	

3.15 PALLADIUM SURFACE PLATING	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Electroless palladium (immersion)	☒	☐			
B) Electroplated palladium	☐	☒			

3.16 SOLDERMASK	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Screened deposited image	☐	☒			
B) Dry film photoimageable	☐	☒			
C) Liquid photoimageable	☒	☐	TAIYO		
D) Dry film/liquid combination	☐	☒			

3.17 ORGANIC SURFACE PROTECTION	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Benzotriazole	☐	☒			
B) Imidazole	☐	☒			
C) Benzimidazole	☐	☒			

3.18 MICROSECTION CAPABILITY	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Manual	☒	☐	BUEHLER	1	
B) Single cavity automated	☐	☒			
C) Multiple cavity automated	☐	☒			
D) Plating thickness analysis	☒	☐	UNITRON METALGRAPH WITH DIGITAL CAMERA	1	

3.19 CHEMICAL ANALYSIS	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Etching chemistry	☒	☐	MISCELLANEOUS		
B) Plating chemistry	☒	☐	MISCELLANEOUS		
C) Effluent (PPM) analysis	☒	☐	MISCELLANEOUS		

3.20 ELECTRICAL TEST EQUIPMENT	YES	NO	EQUIPMENT	QTY	EQUIPMENT LIMITS
A) Continuity and shorts	☒	☐	TRACE 948 TTI DUAL GRID	2 1	60 & 100V 250V
B) Fixture development	☒	☐			
C) Flying probe test	☒	☐	MICROCRAFT MANIA ULTIM8 Hi-Pot Testing available	1	
D) Impedance control	☒	☐	ZMETRIX	1	

MASTER EQUIPMENT LISTING

DATE COMPLETED
06/03/14

FORM MQP 10

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

PLEASE SEE ATTACHMENT

DATE COMPLETED
06/03/14

SECTION 4
TECHNOLOGY PROFILE SPECIFICS

4.1 ADMINISTRATION

4.1.1 CAPACITY PROFILE	EST %	COMMENTS
A) Total annual capacity in square meters (surface area) per month		
B) Presently running at ____ % of capacity	55%	

4.1.2 PERCENTAGE OF DOLLAR VOLUME	EST %	COMMENTS
A) Single sided (rigid)	5	
B) Double sided (rigid)	35	
C) Multilayer (rigid)	60	
D) Single side (unreinforced-flex)		
E) Double sided (unreinforced-flex)		
F) Multilayer (unreinforced-flex) ____		
G) Multilayer (rigid/flex)		

4.1.3 PANEL PRODUCTION PROFILE		UNITS PER MONTH
A) Size of a production lot in panels		
1) Normal	48	
2) Smallest	1-3	
B) Number of panels per month		
1) High Production		3300
2) Medium Production		2200
3) Low Production		1100
3) Short run		650
4) Prototype		410

C) Average lead time (delivery) as defined in B)			
1) High Production	2.5 Weeks		
2) Medium Production	2 Weeks		
3) Low Production	2 Weeks		
3) Short run	3-5 Days		
4) Prototype Quick turn - No. of days 3 Days.	1-5 Days		
D) Product delivered in full panel or array sub-panel format			
1) Total in panel or array format			
2) Scored format			
3) Tab breakaway format			
4) Other			
5) Total to customer layout			
6) Total to manufacturing layout			
E) Product delivered in board format			
1) Total in board format			
2) Extracted: scored to size			
3) Extracted: sheared to size			
4) Extracted: routed to size			
4.1.4 APPROVAL AND CERTIFICATION	**YES**	**NO**	**COMMENTS**
A) Company approvals			
1) UL approval	☒	☐	94V Level. V-0 FILE# E44075
2) Canadian standards	☐	☒	
3) MIL-P-55110	☐	☒	
4) MIL-P-50884	☐	☒	
5) ISO-9002	☐	☒	
6) ISO-9001	☒	☐	REGISTRATION # 04106711 Recertified - September 10, 2012

7) ISO-14000	☐	☒	
8) BABT	☐	☒	
9) EEC	☐	☒	
10) Customer satisfaction	☐	☐	
B) Other certification information			ITAR
1)Laminate	☒	☐	
2)Quality standards	☒	☐	
3)Equipment calibration	☒	☐	

4.1.5 CUSTOMER INTERFACE PROFILE	YES	NO	COMMENTS
A) Modem capability	☒	☐	
B) Baud rate			
C) Data verification technique	☒	☐	DATA COMPARE – DESIGN RULE CHECK
D) Engineering change order process	☒	☐	ENGINEERING CONTROLLED
E) Job status reporting to customers	☒	☐	VIA EMAIL OR TELEPHONE

4.1.6 OTHER CAPABILITIES	YES	NO	COMMENTS
A) Facility research and development	☐	☐	
B) (Automated) On-line shop floor control/MRP system	☒	☐	CIMNET PARADIGM
C) Process control system	☒	☐	
D) Operator training system	☒	☐	

4.2 PROCESS ORIENTATION

4.2.1 LAMINATE MATERIAL	EST %	COMMENTS
A) Most commonly used laminates (G10, FR4, etc.)		Brand name ISOLA Type FR-406HR Brand name ISOLA Type 370 HR Brand name NELCO Type 4000-29 Brand name VENTEC Type VT 47 Brand name GRACE Type GA-170-LL Brand name ISOLA Type GETEK Brand name ROGERS Type Various/Special Brand name ARLON Type Various/Special
B) Other laminate material		TMM, Ceramic, Teflon
1) Planar resistor layers		UL approved ☐
2) BT epoxy		UL approved ☐
3) Kevlar		UL approved ☐
4) Teflon		UL approved ☐ ROGERS NON UL RATED PRODUCT
5) Polyimide		UL approved ☐
6) Cyanate ester		UL approved ☐
7) Other		UL approved ☐
C) Specification to which laminate is purchased (check all that apply) ☐MIL-P-13949 ☐IPC-4204 ☒IPC-4101 ☒UL Approved ☐IPC-4103 ☐Other ☐IPC-4202 ☐IPC-4203		
D) Laminate storage ☒ Uncontrolled ☒ Humidity controlled ☒ Temperature controlled ☐ Dry box ☒ JIT inventory		 RIGID AND FOIL PREPREG PREPREG CONSIGNMENT INVENTORY STORED ON SITE
E) Panel size configurations in X, Y dimesions maximum X 457 Y 610mm minimum X 305 Y 457mm other X _____ Y _____mm		

4.2.2 PROCESS PRECISION SPECIFICS	YES	NO	VALUE	COMMENTS
A) Maximum printed board thickness built in volume				
1) Single sided	X		.125”	
2) Double sided	X		.125”	
3) Multilayer	X		.140”	
4) Rigid flex		X		
B) Printed board electrical performance capability				
1) Impedance control	☒	☐	50, 75, 100 OHM	
2) Capacitance control	☐	☒		
3) Microstrip boards	☐	☒		
C) Tooling system description				
1) Same holes in panels used for all processes	☐	☒		
2) Optical registration	☐	☒		
3) Other	☐	☐		

4.2.3 OTHER PROCESS ORIENTATION SPECIFICS	YES	NO	SYSTEM	COMMENTS
A) Solder mask over bare copper	☒	☐		
B) Plating/coating information				
1) Tin/lead reflow	☐	☒		
2) Hot air leveling	☒	☐	VERTICAL	
3) Azole organic	☐	☒		
4) Conductive	☐	☒		
C) Hole formation				
1) Hole cleaning	☒	☐		
2) Hole cleanliness verified	☐	☒		

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 0.1 mm Tol ± _____ .mm	
2) Inner layers (print and etch)		Size 0.1 mm Tol ± _____ .mm	
3) Outer layers (plated)		Size 0.1 mm Tol ± _____ .mm	
4) Inner layers (plated)	N/A	Size _____ mm Tol ± _____ .mm	
5) Outer layers (additive plating)	N/A	Size _____ mm Tol ± _____ .mm	
6) Inner layers (additive plating)	N/A	Size _____ mm Tol ± _____ .mm	
B) Smallest plated-through hole (PTH) and tolerance consistently produced in 1.5mm thickness material or multilayer board			
1) Minimum PTH diameter		Size 0.25 mm Tol ± _____ .mm	
2) Largest panel where this hole can be controlled (across diagonal)		Size 762 mm Tol ± _____ .mm	
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 762 mm	
2) Largest hole diameter		Size 1.0 mm	
3) Smallest board size (across diagonal)		Size 25 mm	
4) Largest hole diameter		Size 6 mm	
D) Surface mount land pattern pitch (check all that apply) ☒1.27mm [.050] ☒0.63mm [.025] ☒0.5mm [.020] ☒0.4mm [.016] ☐0.3mm [.012] ☐0.25mm [.010] ☐Other _____ .			

E) Solder mask dam between lands (check all that apply) ☒1.27mm [.050] ☒0.63mm [.025] ☒0.5mm [.020] ☒0.4mm [.016] ☒0.3mm [.012] ☒0.25mm [.010] ☒Other .0025" GREEN, .005" BLACK .			
F) Flatness tolerance (bow & twist) after reflow or solder coating ☐1.5% ☐1.0% ☐0.5% ☒Other .75%			

4.3.2 PRODUCT QUALITATIVE AND QUANTITATIVE INFORMATION	YES	NO	QUANTITY OF PANELS	NUMBER or DIMENSION	COMMENTS
A) Multilayer layer count					
1) Maximum layers fabricated in volume (Maximum Lot)				14	
2) Maximum layers fabricated in prototype (Minimum Lot)				14	
B) Buried vias produced consistently in volume	☐	☒			
1) Size					
2) Number of layers					
B) Blind vias produced consistently in volume	☐	☒			
1) Size					
2) Number of layers					
1) Controlled depth drilling	☐	☒			
2) Total number of layers					

4.4. TESTING CAPABILITY

4.4.1 TEST AND TEST EQUIPMENT CAPABILITY	YES	NO	COMMENTS
A) SMT centerline pitch that can be electrically tested ☒ 0.63mm [.025] ☒ 0.5mm [.020] ☒ 0.4mm [.016] ☒ 0.3mm [.012] ☒ 0.25mm [.010] ☒ Other (<.008)			.016 pitch and up can be fixture testing – bed of nails .012 and less must be tested on Flying Probe Equipment
B) Double sided simultaneous electrical testing	☒	☐	Flying Probe & Dual Grid Equipment
1) Equipment type	☒	☐	DUAL GRID, SINGLE SIDED (DEDICATED FIXTURING) AND FLYING PROBE
2) X-ray fluorescence inspection equipment	☒	☐	CMI INTERNATIONAL
3) TDR equipment	☒	☐	ZMETRIX
4) Hi-pot test equipment	☐	☒	
5) Four-wire kelvin tester	☐	☒	

6) Capacitance meter	☐	☒	
7) Cleanliness testing	☒	☐	SPECIALTY COATING SYSTEMS 500M STD NEW FEB 2007

4.4.2 AUTOMATED OPTICAL INSPECTION USAGE	EST. %	COMMENTS
A) Before etching	0	
B) After etching	0	
C) Internal layers	100% 50%	SIGNAL LAYERS POWER & GROUND LAYERS
D) Final inspection	0	
E) Other	0	
F) Conductor/clearance normally inspected by AOI equipment		
1) ☐ 0.05mm [.002]	N/A	
2) ☒ 0.05-.10mm [.002-.004]	100%	INTERNAL LAYERS
3) ☒ >.10mm [.004]	100%	INTERNAL LAYERS
4) ☒ Planes	50&	INTERNAL LAYERS
G) CAD download to AOI	100%	

SECTION 5
QUALITY PROFILE

DATE COMPLETED
06/15/15

GENERAL INFORMATION	
COMPANY NAME SAE CIRCUITS COLORADO INC.	
CONTACT GARY WARNER	
TELEPHONE NUMBER 303-530-1900	FAX NUMBER 303-530-0210

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

5.1 GENERAL QUALITY PROGRAMS		STATUS				
	DESCRIPTION OF PROGRAM	Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
1.	Are quality objectives and responsibilities clearly stated, widely distributed and understood through the company?				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?				100	100
3.	Does a quality measurement system exist with clearly defined metrics and is it utilized as a management tool?				100	100
4.	Are work instructions approved and controlled; and are they under revision control?				100	100
5.	Are the quality procedures and policies current and available at the point of application; and are they under revision control?				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?				100	100
7.	Are Statistical Process Control (SPC) principles understood by all levels of management?				100	100
8.	Are there programs with sufficient resources assigned to support corrective actions and prevention?				100	100
9.	Does management solicit and accept feedback from the work force?				100	100
10.	Is there management support of ongoing training (including quality training), and is it documented by an organizational training plan?				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?				100	100
12.	Are the quality and reliability goals aggressive relative to customer expectations and targeted at continuous improvement?				100	100
13.	Are the people who are responsible for administering the quality assurance function technically informed?				100	100
14.	Does Management have a “defect prevention” attitude to achieve continuous improvement?				100	100

5.2 NEW PRODUCTS/TECHNICAL SERVICES		STATUS				
	DESCRIPTION OF PROGRAM	Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
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			
2.	Is quantitative benchmarking used to evaluate all new products/technologies/services in comparison to best-in-class offerings?		X			
3.	Does a roadmap exist to ensure continued development of leading edge, best-in-class products/technology/services?			X	20	
4.	Is the capability of each operation which controls critical-to-function characteristics for new products, fully certified?		X			
5.	Are statistical tools used in the development of robust (high yield) new processes, products, and services?		X			
6.	When new product/technology/service requires a new process, is it developed jointly and concurrently with the customer and/or suppliers?				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?				100	100
8.	Is the new product/technology/service, as produced by the process, verified to meet all customer satisfaction requirements?				100	100

COMMENTS

5.3 CUSTOMER SATISFACTION		STATUS				
	DESCRIPTION OF PROGRAM	Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
1.	Is there a measurement system in place to assess the customer's perception of complete performance?					100
2.	Is an independent (unbiased) customer survey routinely conducted?	x				
3.	Is there an internal measurement system within the organization which correlates to the level of customer satisfaction?					100
4.	Are there specific goals for achieving Total Customer Satisfaction, both internal and external?			X	50	
5.	To what extent are customer satisfaction goals disseminated and understood by everyone in the organization?					100
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?					100
7.	Is there a method in place to obtain future customer requirements?					100
8.	Are all findings of customer dissatisfaction reported back to the proper organization for analysis and corrective action?					100
9.	Are customer satisfaction requirements formally defined and documented, and are they based on customer input?					100
10.	Do all support organizations understand their role in achieving total customer satisfaction?					100

5.4 COMPUTER INTEGRATED MANUFACTURING		STATUS				
	DESCRIPTION OF PROGRAM	Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
1.	Are systems integrated to allow electronic transfer of information between multiple systems to eliminate redundant data entry?	X				
2.	Can customers electronically transfer CAD/CAM directly into manufacturing?yes					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.)?					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.)?					100
6.	Is information available from system processes in real time (vs. batch processing)?yes					100
7.	Are processes and procedures documented and available on-line?					100
8.	Do all functional departments have system access to key financial, manufacturing, sales, and operational data, as it relates to their functional objectives?yes					100
9.	Are computer simulation and design tools used to the maximum extent practicable in the design of new products/technologies/services	X				

COMMENTS

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

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

COMMENTS

5.7 SKILLS, TRAINING, & CERTIFICATION	DESCRIPTION OF PROGRAM	STATUS				
		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?				100	100
2.	Do all personnel understand how their performance impacts internal and external customer satisfaction?				100	100
3.	Do all personnel who contact external customers reflect quality improvement programs?				100	100
4.	Do personnel participate in professional societies and growth programs?	X				
5.	Are all personnel trained in sufficient detail to support key initiatives?				100	100
6.	Are the results of training evaluated and indicated program changes made?				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			
8.	Are performance standards participatively developed, and regularly applied for all personnel?	X				
9.	Are Total Customer Satisfaction programs and resulting successes publicized to all personnel?				100	100
10.	Do goal setting and reward/incentive programs support the quality improvement process?				100	100

5.8 SUBCONTRACTOR CONTROL	DESCRIPTION OF PROGRAM	STATUS				
		Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
1.	Are requirements defined, communicated, and updated to ensure that the supplier understands expectations?				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			
3.	Have the organization's processes been characterized to identify the critical requirements for the suppliers products?				100	100
4.	Have the capabilities of the supplier's processes been assessed and considered in the establishment of the requirements?				15	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?				100	100
6.	Have quality and cycle time metrics and improvement goals been established participatively with the supplier?				100	100
7.	Has a system been established with the supplier for identification and verification of corrective action?				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?				100	100
9.	Is there a supplier certification program or equivalent procured material/service continuous quality improvement program?	x				
10.	Can all personnel who contract suppliers properly reflect appropriate quality improvement programs and status to them?				100	100

COMMENTS

5.9 CALIBRATION CONTROL		STATUS				
	DESCRIPTION OF PROGRAM	Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
1.	Are calibration and preventative maintenance programs in place and documented?				100	100
2.	Are calibration and maintenance personnel trained?				100	100
3.	Is traceability to NIST maintained?				100	100
4.	Is quality measurement and control equipment current, effective, and sufficiently integrated with production equipment?				100	100
5.	Is the history of quality measurement and control equipment documented?				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%)?				100	100
7.	Are calibration and preventative maintenance cycles on schedule?				100	100
8.	Is the use of non-calibrated equipment for design and production purposes prohibited?				100	100
9.	Are tools and fixtures used as criteria or acceptability of product/work fully qualified and identified?				100	100
10.	Are calibration intervals defined in accordance with industry standards or manufacturer's recommendations and the calibration history of the equipment?				100	100

5.10 INTERNAL AUDITS		STATUS				
	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?				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?				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?				100	100
4.	Are all pertinent methods of statistical quality control properly, effectively and efficiently used?				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?				100	100
6.	Are the operators within the process provided with written work instructions and are they trained? On line work instructions				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?				100	100
8.	Is there a first in/first out (FIFO) system in place, and is it followed?				100	100

COMMENTS

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		
2.	Are statistical techniques used to reduce variation in the engineering process before the start of production?		X			
3.	Is the quality system dependent upon process rather than product controls?	X				
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		50
5.	Are incapable processes or machines targeted for improvement or replacement?			X		50
6.	Is SPC implemented for all critical processes?			X		50
7.	Are procedures that control the reaction to out-of-control situations adequate and effective?				100	100
8.	Are operators trained in the use of appropriate statistical techniques, and are they properly applying them?				100	100
9.	Are advanced problem solving techniques used by engineers to solve problems? (Design of Experiments, planned experimentation, advanced diagnostic tools, etc.)		X			
10.	Are control charts and other process controls properly implemented?				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?				100	100

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			
2.	Does the organization utilize participative problem solving techniques to identify, measure and resolve internal and external problems?				100	100
3.	Are problem solving efforts timely and effective?				100	100
4.	Are applied resources sufficient to remove problem solving constraints?				100	100
5.	Are statistical techniques used for problem solving?				100	100
6.	Are quality data used to identify barriers, and to determine the priority of problems?				100	100
7.	Is there a policy/procedure that includes the use of problem solving techniques to systematically drive reduction in variability?				100	100

COMMENTS

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

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

COMMENTS

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

5.16 NON-CONFORMING MATERIAL CONTROL		STATUS				
	DESCRIPTION OF PROGRAM	Not Applicable	Not Started	Approach Developed	Percent Deployed	Percent Results
1.	Is non-conforming material identified, segregated from regular production material, and properly dispositioned?				100	100
2.	Are non-conforming materials properly identified and controlled to prevent inadvertent use?				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?				100	100
4.	Are procedures for controlling non-conforming materials, and for ensuing corrective action, in place and followed?				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)				100	100
6.	Do supplier's procedures and controls for corrective action prevent recurrence of non-conformances?				100	100
7.	Is there a system for coordinating necessary corrective action with purchasing personnel?				100	100
8.	Does the corrective action extend to all applicable causes of non-conformance (e.g., design, workmanship, procedures, equipment, etc.)?				100	100

COMMENTS

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

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

COMMENTS

5.19 TOOLING INSPECTION, HANDLING, & STORAGE		STATUS				
	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	25	100
2.	Do operators use hairnets, gloves & lab coats in all photolab and photoexposure areas?				100	100
3.	Are work instructions and related forms in place to control all applicable tooling requirements, as stated in the customer's purchase order?				100	100
4.	Are customer provided artworks controlled with regard to handling, storage, revision control and relationship to converted production phototools (working films)?				100	100
5.	Are production phototools (working films) controlled with regard to handling, storage, use life, and relationship to customer purchase order?				100	100
6.	Are customer provided artworks and production phototools (working films) inspected, including dimensional checks?				100	100
7.	Are all tools, fixtures, and other devices, used for tooling inspection and control, maintained under the calibration control procedure?	X				
8.	Are records showing initial acceptance, periodic checks, and any needs for rework and/or modification available?				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?				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.				100	100
3.	Is positive action taken to prevent recurrence of problems, and are there documented reports/records of each occasion?				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?				100	100
5.	Is corrective action controlled and documented for all applicable work centers?				100	100
6.	When corrections are made, is their effectiveness subsequently reviewed and monitored?				100	100

COMMENTS

DATE COMPLETED
06/15/15

SECTION 6 (CHECK ONE IN EACH LINE THAT APPLIES)
MANUFACTURING HISTORY (See Section 2 Site Capability)

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
☒<250 [<10.00]	☒<1,0 [<.040]	☒1-4 [1-4]	☒>0,5 [>.020]	☐>0,250 [> .010]	☐**>0,50 [>.020]**
☒250 [10.00]	☒1,0 [.040]	☒5-6 [5-6]	☒0,5 [.020]	☐0,250 [.010]	☐**0,50 [.020]**
☒350 [14.00]	☒1,6 [.060]	☒7-8 [7-8]	☒0,4 [.016]	☐0,200 [.008]	☐**0,40 [.016]**
☒450[17.50]	☐2,0 [.080]	☒9-12 [9-12]	☒0,35 [.014]	☐0,150 [.006]	☒**0,30 [.012]**
☒550 [21.50]	☒2,5 [.100]	☒13-16 [13-16]	☒0,30 [.012]	☒0,125 [.005]	☒**0,25 [.010]**
☒650 [25.50]	☒3,5 [.135]	☐17-20 [17-20]	☒0,25 [.010]	☐0,100 [.004]	☒**0,20 [.008]**
☒750 [29.50]	☐5,0 [.200]	☐21-24 [21-24]	☐0,20 [.008]	☒0,075 [.003]	☒**0,15 [.006]**
☐850 [33.50]	☐6,5 [.250]	☐25-28 [25-28]	☐0,15 [.006]	☒0,050 [.002]	☐**0,10 [.004]**
☐>850 [>33.50]	☐>6,5 [>.250]	☐>28 [>28]	☐<0,15 [.006]	☐<0,050 [<.002]	☐**<0,10 [<.004]**
☐Other:	☐Other:	☐Other:	☐Other:	☐Other:	☐**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
☒>0,350 [>.014]	☒>0,250 [>.010]	☐>0,100 [>.004]	☒>0,350 [>.014]	☒>0,250 [>.010]	☐>0,100 [>.004]	☐>0,50 [>.020]
☒0,350 [.014]	☒0,250 [.010]	☐0,100 [.004]	☒0,350 [.014]	☒0,250 [.010]	☐0,100 [.004]	☐0,50 [.020]
☒0,250 [.010]	☒0,200 [.008]	☐0,075 [.003]	☒0,250 [.010]	☒0,200 [.008]	☐0,075 [.003]	☐0,40 [.016]
☒0,200 [.008]	☒0,150 [.006]	☒0,050 [.002]	☒0,200 [.008]	☒0,150 [.006]	☒0,050 [.002]	☒0,30 [.012]
☒0,150 [.005]	☒0,125 [.005]	☐0,040 [.0015]	☒0,150 [.006]	☒0,125 [.005]	☐0,040 [.0015]	☒0,25 [.010]
☒0,125 [.005]	☒0,100 [.004]	☐0,030 [.0012]	☒0,125 [.005]	☒0,100 [.004]	☐0,030 [.0012]	☒0,20 [.008]
☒0,100 [.004]	☐0,075 [.003]	☒0,025 [.001]	☒0,100 [.004]	☐0,075 [.003]	☒0,025 [.001]	☒0,15 [.006]
☐0,075 [.003]	☐0,050 [.002]	☒0,020 [.0008]	☐0,075 [.003]	☐0,050 [.002]	☒0,020 [.0008]	☐0,10 [.004]
☐<0,075 [<.003]	☐<0,050 [<.002]	☐<0,020 [<.0008]	☐<0,075 [<.003]	☐<0,050 [<.002]	☐<0,020 [<.008]	☐<0,10 [<.004]
☐Other:	☐Other:	☐Other:	☐Other:	☐Other:	☐Other:	☐Other:

DATE COMPLETED
06/15/15

SECTION 7

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
06/15/15

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 SAE CIRCUITS COLORADO, INC.		
TAXPAYER ID NUMBER 841134990	DUNS NUMBER 620651802	TRADING SYMBOL
ANNUAL SALES >See the attached letter on our financial disclosure policy	PRIOR YEAR 2008	YEAR-TO-DATE
FISCAL YEAR November 1 to October 31		
BANK JP Morgan Chase	ACCOUNT NUMBER See financial disclosure letter for bank contact information.	
BANK ADDRESS 1301 Canyon Blvd	STATE Boulder, CO	ZIP 80302
PROVINCE	COUNTRY United States of America	
BANK TELEPHONE NUMBER	FAX NUMBER	
COMMENTS		

SITE FINANCIAL DESCRIPTION

SITE NAME SAME		
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.