



SAE Circuits Express

CONTROL PLAN

Rev: Mar. 01, 2017

Part or Process Serial Number	Process Name Operation Description	Production Equipment or Production Tool	Character	Product	Process	Method Product/Processes Criterion /Tolerance	Evaluated /Measurement Technique	Swatch Content	Frequency	Control Method	Reaction to Plan
			Serial Number								Department
001	Contract review	Computer		Advanced Order Form	Contract Reliew	PDDOC008					
050	Pre-Process CAM Engineering	Computer		Production Traveler	Engineerig FA	ENDOC003					
				Silver Film Plots	Engineering	ENDOC001					
100	Incoming material	Copper Clad Laminate	1	Material Certs - Filed	Material Receipt	SHDOC002				File Certs in QA File Cabinet	
		Prepreg & Copper Foil	2	Material Certs Filed	Material Receipt	SHDOC002					
200	Material Release	Core Laminate	1	Material Thickness	Cores Only	DRDOC001	Micrometer	Piece/Lot #	Every Lot #		Recheck and Reject if applicable
			2	Base Copper Foil Thickness	Cores Only	DRDOC001	Copper Thickness Gage - Electronic	Piece/Lot #	Every Lot #		Recheck and Reject if applicable
300	Core Laminate Prep	TSC Chem Clean Module	1	Chemical Clean	Cores Only	WPDOC010	Visual - Operator Inspection	All Panels	All Panels	Analytical Lab Records - Chem Concentration	
400	Dry Film - Image I/L Cores	Dupont HRL-24 Laminator	1	Laminate Dry Film	Cores Only	DFDOC001	Visual - Operator Inspection	All Panels	All Panels		
		Exposure Units	2	Expose Image	Cores Only	DFDOC001	Visual - Operator Inspection	1st Article - AOI	Every P/N	Sign Traveler	Recheck and Reject if applicable
		TSC Developer & Test Coupon	3	Step Test for Develop	Cores Only	DFDOC001	Visual - Step test coupon	Setup	Every Order	Adjust speed as necessary for test result	
		TSC Developer	4	Develop order	Cores Only	DFDOC002	Visual - Operator Inspection	All Panels	All Panels	Dry Film Develop Log	Recheck and Reject if applicable
500	Etch Cores	Chemcut I/L Etcher	1	First Article Panel	I/L Etch	WPDOC013	Scope - Measure Line Width	1st Article	Every Lot #	Record Start & Finish Line Width on Traveler	Recheck, adjust speed and perform a new FA if necessary
			2	Etch Panels	I/L Etch	WPDOC013	Visual - Operator Inspection	All Panels		Sign Traveler	Recheck and Reject if applicable
600	Resist Strip	TSC Resist Stripper	1	Resist Strip Panels	Resist Strip	WPDOC014	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck & reprocess if necessary
700	AOI Innerlayer Cores	Mania AOI	1	I/L Cores	AOI	ENDOC004	Line Widths, Opens, Shorts	All Panels	Every Order	Sign Traveler	Reject & Restart as applicable
800	Oxide Alternative	Custom Oxide Line	1	Coat All I/L Cores	Oxide Alt.	WPDOC002	Visual for complete coverage - Operator Inspection	All Panels	Every Order	Sign Traveler	Reject and rework as applicable

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900	Lamination	Lay-up	1	Layup Cores, Prepreg & Foil	Per Traveler Layup Inst	LMDOC001	Book Thickness - Micrometers	All Books	Every Load	Sign Traveler	N/A
		Lamination - TMP Lam Press (6 plates)	2	Lamination Books	Lamination	LMDOC001	Panel Thickness - Micrometers	Sample	Every Order	Log Low & High Thickness Measurement on traveler - Complete LAMLOG001	Recheck Measurements & Reject if Applicable - Notify Process Engineer
		Lamination - TMP Lam Press (2 plates)	3	Lamination Books	Lamination	LMDOC001	Panel Thickness - Micrometers	Sample	Every Order	Log Low & High Thickness Measurement on traveler - Complete LAMLOG001	Recheck Measurements & Reject if Applicable - Notify Process Engineer
		Flash removal - Excellon XL-5 Router	4	All Panels	Flash removal	LMDOC001	Panel Size - Calipers	All Panels	Every Order	Complete RTFRM011 - Sign Traveler	Recheck and Reject if applicable
1000	Drill	Pinning for Drill	1	All Single & D/S Panels - MLB has separate tooling not requiring pinning	Pin	DRDOC001	Visual -Operator Inspection	All Panels	Every Order	Sign Traveler	N/A
		Excellon HVP Drill	2	All Panels	1st Article Drill	DRDOC002	Hole Sizes & Locations	1st Article	Xray	Verify Hole Location using Glenbrook Xray for MLB Panels and Pin Gage Hole Sizes	
		Excellon HVP Drill	2	All Panels (1 Lyr thru 14 Lyr)	Drill Production	DRDOC002	Hole Sizes & Locations	Bottom Panel	Ind Spindles	Sign Traveler	Recheck and Reject if necessary
		Excellon Mark VI Drills	3	All Panels (1 Lyr thru 14 Lyr)	1st Article Drill	DRDOC002	Hole Sizes & Locations	1st Article	Xray	Verify Hole Location using Glenbrook Xray for MLB Panels and Pin Gage Hole Sizes	
		Excellon Mark VI Drills	4	All Panels (1 Lyr thru 14 Lyr)	Drill Production	DRDOC002	Hole Sizes & Locations	Bottom Panel	Ind Spindles	Sign Traveler	Recheck and Reject if necessary
1100	Debur	Chemcut Debur	5	Drilled Panels	Debur	WPD0003	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck and Reprocess as necessary
1200	Electroless Copper	IPS Electroless Copper	1	Desmear (MLB's) and Electroless Copper Plate all Panels	Desmear & Electroless Copper	WPD0004	Backlight (BL) Coupons, Weight Gain Coupons, Weight Loss Coupons - Balance Scale and Metallurgical Scope	BL Coupons (2 per shift), Weight Loss & Gain Coupons - 1 daily - Visual for Voids	Daily & Visual all panels	Cuposit List WPF0007 - Sign Traveler	Recheck and Reject if applicable
1300	Dry Film - Image	Dupont HRL-24 Laminator	1	Laminate Dry Film	Cores Only	DFDOC001	Visual - Operator Inspection	All Panels	All Panels		
		Exposure Units	2	Expose Image	Cores Only	DFDOC001	Visual - Operator Inspection	1st Article - AOI	Every P/N	Sign Traveler	Recheck and Reject if applicable
		TSC Developer & Test Coupon	3	Step Test for Develop	Cores Only	DFDOC001	Visual - Step test coupon	Setup	Every Order	Adjust speed as necessary for test result	
		TSC Developer	4	Develop order	Cores Only	DFDOC002	Visual - Operator Inspection	All Panels	All Panels	Dry Film Develop Log	Recheck and Reject if applicable

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1400	Electrolytic Copper Plate	Eidshun Electroplate Line	1	Copper Plate	All Through Hole	WPD0C006	CMI - PTX 200 Portable Electronic Caviderm	Sample	Every Load	Minimum deposition of 1.2 mils is required before accepting deposition rate and removing order from copper plate	Recheck and add more plate time if necessary until 1.2 mils minimum requirement is satisfied
			2	Tin Plate	All Through Hole	WPD0C006	Specified Time	Visual for Coverage	Every Load	N/A	N/A
1500	Body Plate - Connector Tabs (Ni/AU)	Tape Connectors	1	Manual tape Process	Connectors	WPD0C011	Visual - Operator Inspection	N/A	All Tab Plate Panels	Tab Dimension Height per Print	N/A
		Selrex Tabplate	2	Ni/Au Tabplate	1st Article - Ni/AU Thickness	WPD0C001	1st Article - CMI 900 Fluorescence X-Ray	1st Article	Every Order	Analytical Lab records (Chemistry) and CMI Report for Ni/Au Deposition	Recheck and Reject if necessary
		Selrex Tabplate	3	Ni/Au Tabplate	Tab Plate Panels	WPD0C001	Visual & Xray	Xray Sample 1% Order	Every Order		
1600	Resist Strip	Chemcut 547-30XL Resist Strip Module	1	Resist Strip Panels	Resist Strip	WPD0C008	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck and reprocess if applicable
1700	Etch Copper	Chemcut CS2000 Etcher	1	First Article Etch	O/L Etch	WPD0C009	Scope - Measure Line Width	1sr Article	Every Order	Record Start & Finish Line Width on Traveler	Recheck, adjust speed and perform a new FA if necessary
		Chemcut CS2000 Etcher	2	Etch Panels	Outer Layer Etch	WPD0C009	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler - All rework to be noted on traveler	Recheck and Reject if necessary
1800	Tin Strip	Chemcut CS2000 Tin Strip Module	1	Tin Strip Panels	Tin Strip	WPD0C007	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck and reprocess if applicable
1900	ENIG (Reliavia)	Custom ENIG Line	1	Plate Panels	ENIG	WPD0C015	CMI 900 Fluorescence X-Ray for deposition - Visual - Operator Inspection	CMI Readings (5 minimum) - Visual - Operator Inspection	Every Order	Analytical Lab records (Chemistry) and CMI Report for ENIG Deposition, Sign Traveler	Recheck and Reject if necessary
		Chemical Clean - TSC Chem Clean Module	1	Chemical Clean Panels	Soldermask App	SMD0C004	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck and Re-clean if necessary
		DP-1500 Soldermask Coater	2	Soldermask Coat Panels	Soldermask App	SMD0C001	Solvent Loss Test - Visual - Operator Inspection	Solvent Loss Test Once Daily, Visual All Panels	Every Order	Record Solvent Loss Data on SMFRM001, Sign Traveler	Recheck and Strip S/M and recoat if necessary
		ORC HMW680GW Exposure Unit (S/M Expose) & VCM S/M Developer	3	Expose & Develop Soldermask - 1st Article Panel	Soldermask App	SMD0C005	1st Article - Supervisor or QA as available	1st Article	Every Order	Sign Traveler for 1st Article	Recheck and Reject if necessary

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2000	Soldermask	ORC HMW680GW Exposure Unit (S/M Expose) & VCM S/M Developer	4	Expose & Develop Soldermask - All Panels	Soldermask App	SMDOC005	Step test 1/2 way through order, Visual - Operator Inspection - Eye Loupe as necessary	All Panels	Every Order	Record Step test Results on SMFRM002, Sign Traveler	Recheck and Reject if necessary
		Grieve & Precision Quincy Ovens - Soldermask Thermal Cure	5	Thermal Cure Soldermask	Soldermask App	SMDOC005	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck and Reject if necessary
2100	Standard - Connector Tabs (Ni/AU)	Tape Connectors	1	Manual tape Process	Connectors	WPD0C011	Visual - Operator Inspection	N/A	All Tab Plate Panels	Tab Dimension Height per Print	N/A
		Selrex Tabplate	2	Ni/Au Tabplate	1st Article - Ni/AU Thickness	WPD0C001	1st Article - CMI 900 Fluorescence X-Ray	1st Article	Every Order	Analytical Lab records (Chemistry) and CMI Report for Ni/Au Deposition	Recheck and Reject if necessary
		Selrex Tabplate	3	Ni/Au Tabplate	Tab Plate Panels	WPD0C001	Visual & Xray	Xray Sample 1% Order	Every Order	Sign Traveler	Recheck and Reject if necessary
2200	Hot Air Solder Level - (HASL)	Argus PreClean 5520 & Fluxer Unit 3215	1	Pre-Clean & Flux 1st Article Panel	HASL	WPD0C012	N/A	N/A	N/A	N/A	N/A
		Avalon Avtec 4000 HASL Module	2	HASL - 1st Article Panel	HASL	WPD0C012	1st Article Panel - CMI 900 X-Ray for Solder Thickness - Pin Gage Hole Sizes	1st Article	Daily Check	N/A	Recheck and Reprocess panel as necessary
		Argus PreClean 5520 & Fluxer Unit 3215	3	Pre-Clean & Flux - All Panels	HASL	WPD0C012	N/A	N/A	N/A	N/A	N/A
		Avalon Avtec 4000 HASL Module	4	HASL - All Panels	HASL	WPD0C012	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler - CMI Report for HASL Thickness	Recheck and Reprocess panel as necessary
2300	Nomenclature (Legend)	Hand Screen Operation	1	Legend - 1st Article	Legend	SMDOC002	1st Article - Visual by Operator	1st Article	Every Order		Adjust Screen tension as necessary
		Hand Screen Operation	2	Legend	Legend	SMDOC002	Visual - Operator Inspection	All Panels	Every Order	Sign Traveler	Recheck and Reject if necessary
		Gireve Ovens - Legend Cure	3	Legend Cure	Legend	SMDOC002	N/A	All Panels	Every Order	Sign Traveler	N/A

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2400	Score	Accu-Score AS-200	1	V-Score 1st Article	V-Score	RTDOC003	1st Article V-Score, Measure depth using Accu-Score Digital V-Score Checker, measure X & Y Dimensions using Calipers	1st Article Panel	Every Order	1st Article Approval Signed on Traveler	Recheck and Reject if necessary
		Accu-Score AS-200	2	V-Score Panels	V-Score	RTDOC003	Check Score Depth by measuring with Accu-Score Digital V-Score Checker, Measure X & Y Dimensions using Calipers	All Panels	Every Order	Sign Traveler	Recheck and Reject if necessary
2500	Rout	Excellon XL-3, XL-5 & Mark V Driller/Router Machines	1	Rout 1st Article Panel	Rout	RTDOC004	Verify 1st Article Rout Dimensions using Caliper for Specified Dimensions per Print	1st Article Panel	Every order	1st Article Approval Signed on Traveler	Recheck and Reject if necessary
		Excellon XL-3, XL-5 & Mark V Driller/Router Machines	2	Rout - All Panels	Rout	RTDOC004	Verify Rout Dimensions every third run using Caliper for Specified Dimensions per Print	Every Third Run	Every order	All Zero Correction Factor adjustments must be recorded on RTFRM011 form, Sign Traveler	Recheck and Reject if necessary
		Barnaby Beveler (edge beveling), Delta Drill Press (Countersink/Counterbore), Upright Belt Sander (Nub Removal)	3	Final Fabrication	Rout	RTDOC002	Verify Bevel, Countersink/Counterbore and Nub Removal as necessary to meet print dimensions	All Boards as applicable	Every Order	Sign Traveler	Recheck and Reject as necessary
		Final Board Wash/Clean	4	Final Fabrication	Rout	RTDOC002	Visual - Operator Inspection	All Boards	Every Order	Sign Traveler	N/A
2600	Electrical Test	Subcontracted - Flying Probe, Dual Grid, 9090 Tester	1	Electrical Test	Electrical Test	Sub-Contracted	Pass-Fail Tags	All Boards	Every Order as applicable	Test Cert Provided with every order	N/A

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2700	Final QA Inspection	Various Pin Gages, Calipers, Micrometers, Granite Surface Plate, Scopes, Eye Loupes, Halo Inspection Lamps	1	Inspection - 1st Article	Final Inspection	QADOC003	verify all dimensions, notes and requirements per Print	1st Article Board	Every order	Complete QA Holes/Defect Chart - Appropriate 1st Article Documentation specified by customer when applicable	Recheck and Reject as necessary
			2	Inspection - All Boards - Sample Plan may be used at 2.5 AQL level per ANSI/ASQC Z1.4 1993 Standard based upon complexity of product	Final Inspection	QADOC003	Visual Inspection by QA Department Inspectors	All Boards as applicable	Every order	Sign Traveler	Recheck and Reject as necessary
2800	Immersion Silver	Customer Sterling Silver Line	1	Silver Coat - All Panels	Silver Plate	WPD0C018	1 piece deposition thickness checked on CMI 900 Fluorescence X-Ray, Visual-Operator Inspection All Boards	1 Piece Measurement for deposition, All Boards Visual	Every Order	Sign Traveler	Recheck and Reject as necessary
2900	Controlled Impedance Testing	Polar CITS-500 TDR	1	Test Coupons	Impedance testing	ENDOC004 & Equipment Instructions	Test CI with TDR	Coupons	Applicable Orders	Sign Traveler, Print CI Test report and place in Traveler Package	Recheck and Reject as necessary
3000	Packaging and Ship	CII Vacuum Sealing Equipment, AIE-455FI Impulse MBB Foot sealer, Vacuum Seal Amine Free Bubble Wrap, Scc 2000MQPL Type1 Moisture Barrier Bags, Desiccant Material, Humidity Indicator Strips, Single & Double Wall Boxes, Clear bags, Bubble Pak	1	Package and Ship	Ship	SHDOC001	Count product, measure weight of boxes with scale, Identify Product Markings on Boxes and Documentation - Visual - Shipping Clerk Inspection	All Boards	Every Order	Sign Traveler	