

Quality Assurance and Certification

APPLICATION NOTE FOR INTERPOINT® PRODUCTS APPENDIX A - ELEMENT EVALUATION TABLES

THE FOLLOWING TABLES ARE FROM MIL-PRF-38534 L AS THEY APPLY TO INTERPOINT PRODUCTS.

MIL-PRF-38534 L, Section C.3.1 NOTE: Elements used in compliant hybrid microcircuits with element evaluation successfully completed prior to the implementation date (3 Jun 2020) of this specification are permitted and shall follow the element evaluation requirements in MIL-PRF-38534 at the time element evaluation was initiated.

The Element Evaluation tables are referenced to MIL-PRF-38534 L tables which are listed in parentheses.

Appendix A: Element Evaluation Tables ¹

- “Table A: Microcircuit Dice Evaluation Requirements” (Table C-II) page 12
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- 1. Referenced MIL-PRF-38534 table is listed in parentheses.
- 2. Table E applies to purchased magnetics. It does not apply to magnetics made in-house by Crane which are made on a qualified line and do not require additional Element Evaluation.

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TABLE A: MICROCIRCUIT DICE EVALUATION REQUIREMENTS
(Table C-II of MIL-PRF-38534 L)

Subgroup	Class		Test	Specification or Standard	Method	Condition	Comments	Quantity (accept number)	Reference paragraph MIL-PRF - 38534
	K	H							
1	X	X	Element Electrical	Per Acquisition Document			25 °C	100%	C.3.3.1
	X	X	Element Visual	MIL-STD -883	2010	B		100%	C.3.3.2
2	X	X	Element Visual	MIL-STD -883	2010	A			
	X	X	Internal Visual	MIL-STD -883	2010	B			C.3.3.3
3	X	X	Internal Visual	MIL-STD -883	2010	A			C.3.3.4.2
	X	X	Initial Electrical	Per Acquisition Document			25 °C Record Data	10(0)	
4	X	X	Temperature Cycle	MIL-STD -883	1010	C	20 Cycles		C.3.3.3
	X	X	Mechanical Stress <u>1/</u>	MIL-STD -883 - Constant Acceleration	2001	A	Y1 Direction		
	X	X	Interim Electrical	MIL-STD -883 - Mechanical Shock	2002	B	Y1 Direction		C.3.3.4.3
	X	X	Burn-In <u>2/</u>	Per Acquisition Document	1015		25 °C Record Data		
	X	X	Post-BI Electrical <u>3/</u>	MIL-STD -883			240hrs Min. at Tc or Ta = 125°C Min.		C.3.3.4.3
5	X	X	Steady State Life <u>2/</u>	Per Acquisition Document	1005		25 °C, -55 °C, 125 °C Record Data		
	X	X	Final Electrical <u>3/</u>	Per Acquisition Document			1000hrs at Tc or Ta = 125 °C Min. or 500hrs at Tc = 150 °C Min.		
	X	X	Wirebond Evaluation <u>4/</u>	MIL-STD -883	2011		25 °C, -55 °C, 125 °C Record Data	10(0) or 20(1) wires	C.3.3.3 C.3.3.5
6	X	SEM <u>5/</u>	MIL-STD -883	2018		Bake for 1 hour minimum @ +300°C (Bimetallic bonds only)	See <u>5/</u>	C.3.3.6	

1/ Either test method is applicable.
 2/ High power devices may be tested at Max Tj when Ta/Tc would cause Tj to exceed max operating temperature. 3/ Perform Delta Limit Calculation results against the previous electrical test performed when required by the acquisition document.
 4/ Bond wires must be selected to accurately reflect the wire bond system used on the hybrid.
 5/ The quantity accept (reject) requirements specified herein for element evaluation supersede the sample size and selection requirements of method 2018 of MIL-STD-883. If the die are from a known homogeneous single wafer, then the sample size shall be 4 devices randomly selected from the wafer. If the die are from a non-homogeneous wafer lot (traceability is unknown or no objective evidence is available for verification), then the sample size shall be 8 devices randomly selected from the population. If the die are from known homogeneous multiple (two or more) wafers, then the sample size shall be 4 devices randomly selected from each of two wafers in the lot, 8 devices total. If any wafer from the lot fails, all remaining wafers in the lot must be tested (4 devices randomly selected from each wafer) to be verified as acceptable for use.

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TABLE B: SEMICONDUCTOR DICE EVALUATION REQUIREMENTS
(Table C-II-1 of MIL-PRF-38534 L)

*Interpoint Products do not have SCR components

Subgroup	Class		Test	Transistor - Signal	Transistor - Power	Diode - Zener	Diode - Power, Rectifier	MOSFET - Power	SCR *	Specification or Standard	Method	Condition	Comments	Quantity (Accept number)	Reference paragraph MIL-PRF - 38534	
	K	H														
1	X	X	Element Electrical	X	X	X	X	X	X	Per Acquisition Document MIL-STD - 750	2069		25° C	100%	C.3.3.1	
	X	X														
2	X	X	Element Visual	X						MIL-STD - 750	2070			100%	C.3.3.2	
	X	X		X							2072					
	X	X		X							2073					
	X	X														
3	X	X	Internal Visual							MIL-STD - 750	2069			10(0)	C.3.3.3	
	X	X		X							2070					
	X	X		X							2072					
	X	X									2073					
4	X		Initial Electrical 1/ Temperature Cycle 2/	X	X	X	X	X	X	Per Acquisition Document MIL-STD - 883	1010		25° C Record Data 20 Cycles	10(0)	C.3.3.3	
	X			X	X	X	X	X	X							MIL-STD - 750
	X		Surge							MIL-STD - 750	4066					
	X															

See footnotes at end of table.

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TABLE B: SEMICONDUCTOR DICE EVALUATION REQUIREMENTS (CONTINUED)
(Table C-II-1 of MIL-PRF-38534 L)

*Interpoint Products do not have SCR components

Subgroup	Class		Test	Transistor - Signal	Transistor - Power	Diode - Zener	Diode - Power, Rectifier	MOSFET - Power	SCR	Specification or Standard	Method	Condition	Comments	Quantity (Accept number)	Reference paragraph MIL-PRF - 38534
	K	H													
4	X		Mechanical Stress <u>2</u> /	X	X	X	X	X	X	MIL-STD -883 - Constant Acceleration	2001	A	Y1 Direction 5000g	10(0)	
										MIL-STD -750 - Constant Acceleration	2006				
X	X			X	X	X	X	X	X	MIL-STD -883 - Mechanical Shock	2002	B	Y1 Direction		
										MIL-STD -750 - Mechanical Shock	2016				
X	X		Interim Electrical <u>1</u> /	X	X	X	X	X		Per Acquisition Document			Record Data		C.3.3.4.3
X	X		High Temperature Reverse Bias (HTRB) <u>3</u> /	X	X					MIL-STD -750	1039	A	80% Min. of rated VCB (bipolar), as applicable.		C.3.3.3
X	X							X		MIL-STD -750 - Burn-in (Power MOSFET)	1042	B	80% Min. of rated VGS.		
X	X					X	X			MIL-STD -750 - Burn-in (Power MOSFET) Reverse Bias (Zener, Rectifier)	1038	A	80% Min. of rated VR or VRWM when DC conditions are specified. 95-100% of VRWM, when half sine condition is specified.		

See footnotes at end of table.

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TABLE B: SEMICONDUCTOR DICE EVALUATION REQUIREMENTS (CONTINUED)
(Table C-II-1 of MIL-PRF-38534 L)

*Interpoint Products do not have SCR components

Subgroup	Class		Test	Transistor - Signal	Transistor - Power	Diode - Zener	Diode - Power, Rectifier	MOSFET - Power	SCR	Specification or Standard	Method	Condition	Comments	Quantity (Accept number)	Reference paragraph MIL-PRF - 38534
	K	H													
4	X		Interim Electrical <u>1/3/</u>	X	X	X	X	X	X	Per Acquisition Document			25° C Record Data	10(0)	C.3.3.4.3
	X		Burn-In	X	X					MIL-STD - 750	1039	B	240hrs Min at Tj=Max rated, +0° C, -25° C		
	X							X		MIL-STD - 750	1042	A	240hrs Min at Tj=Max rated, +0° C, -25° C		
	X					X				MIL-STD - 750	1038	B	240hrs Min at Tj=Max rated, +0° C, -25° C		
	X								X	MIL-STD - 750	1040	B	240hrs Min at Tj=Max rated, +0° C, -25° C		
	X		Post BI Electrical <u>1/4/</u>	X	X	X	X	X	X	Per Acquisition Document			25° C, -55° C, 125° C Record Data		C.3.3.4.3

1/ Test parameters chosen from applicable MIL-PRF-19500 slash sheet, applicable manufacturer's data sheet, and/or acquisition document.
 2/ Either test method is applicable.
 3/ When High Temp Reverse Bias (HTRB) is performed, leakage current shall be measured on each device before any other specified parametric test is performed and completed within 16 hours of HTRB completion.
 4/ When required by the acquisition document, perform delta limit calculations. 5/ Select bond wires that represent the wire bond process used in the hybrid.
 6/ SEM is not required for semiconductor dice without expanded metallization (reference method 2077 of MIL-STD-750).
 7/ The quantity accept (reject) requirements specified herein for element evaluation supersede the sample size and selection requirements of method 2018 of MIL-STD-883 and method 2077 of MIL-STD-750. If the die are from a known homogeneous single wafer, then the sample size shall be 4 devices randomly selected from the wafer. If the die are from a non-homogeneous wafer lot (traceability is unknown or no objective evidence is available for verification), then the sample size shall be 8 devices randomly selected from the population. If the die are from known homogeneous multiple (two or more) wafers, then the sample size shall be 4 devices randomly selected from each of two wafers in the lot, 8 devices total. If any wafer from the lot fails, all remaining wafers in the lot must be tested (4 devices randomly selected from each wafer) to be verified as acceptable for use.

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TABLE C: WIRE BONDABLE AND SURFACE MOUNT RESISTORS 1/ 2/
(Table C-III of MIL-PRF-38534 L)

Subgroup	Class		Test	Wire Bondable Resistors	Surface Mount Resistors	Standard or Specification	Method / Paragraph	Condition	Comments	Quantity (accept number)		Ref Para MIL - PRF - 38534
	K	H								Class K Samples	Class H Samples	
1	X	X	Element Electrical	X	X	MIL-PRF - 55342	3.8		25C	100%	100%	C.3.4.1
2	X	X	Visual Inspection	X	X	MIL-STD - 883	2032	H			22(0)	C.3.4.2
	X			X	X	MIL-STD - 883	2032	K		100%		
	X	X	Device Finish 3/	X	X	MIL-PRF - 38534				2 (0)	2 (0)	
3	X		Element Electrical	X	X	MIL-PRF - 55342	3.8		Measure & Record DC Resistance @ 25C	10(0)		C.3.4.4
	X		Thermal Shock or Temperature Cycle	X	X	MIL-STD - 202	107	F	-65C to +150C, 10 Cycles	10(0)		C.3.4.3
						MIL-STD - 883	1010	C	-65C to +150C, 10 Cycles			
	X		Mechanical Shock or Constant Acceleration	X	X	MIL-STD - 883	2002	B	Y1 Direction	10(0)		
							2001	A	Y1 Direction			

See footnotes at end of table.

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TABLE C: WIRE BONDABLE AND SURFACE MOUNT RESISTORS (CONTINUED) 1/ 2/

(Table C-III of MIL-PRF-38534 L)

Subgroup	Class		Test	Wire Bondable Resistors	Surface Mount Resistors	Standard or Specification	Method / Paragraph	Condition	Comments	Quantity (accept number)		Ref Para MIL-PRF-38534
	K	H								Class K Samples	Class H Samples	
3	X		Power Conditioning	X	X	MIL-PRF-55342	3.10	4.8.4	100 hours @ 70°C, 1.5X Rated Power	10(0)		
		X	Element Electrical	X	X	Acquisition Document or MIL-PRF-55342	3.8		Measure & Record DC Resistance @ 25C		10(0)	C.3.4.4
	X		Element Electrical 4/	X	X	MIL-PRF-55342	3.8		Measure & Record DC Resistance @ 25C Tolerance and Delta R.	10(0)		C.3.4.4
4	X	X	Wirebond Evaluation	X		MIL-PRF-55342	3.19.3			10 (0) or 20 (1) wires	10 (0) or 20 (1) wires	C.3.4.3 C.3.4.6
				X		MIL-STD-883	2011					

1/ Samples shall be taken from each production lot for each resistance value.
 2/ Parts procured as mil-prf-38534 product level T or with Established Reliability (ER) failure rate R, S, U, or V are acceptable for use as is.
 3/ Using a recognized methodology (e.g. method 2037 of MIL-STD-883, JESD213) verify that finishes containing Tin (Sn) have a minimum of 3% lead (Pb) by weight per MIL-PRF-38534.
 4/ Delta R shall not exceed +/-0.5% after completion of test(s), unless otherwise specified in acquisition document.

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TABLE D: CHIP CAPACITORS, SOLID TANTALUM 1/
(Table C-III-2 of MIL-PRF-38534 L)

Subgroup	Class		Test	Standard or Specification	Method	Condition	Comments	Quantity (accept number)	Reference Paragraph MIL-PRF - 38534
	K	H							
1	X	X	Element Electrical	MIL-PRF -38534		25C	Per Acquisition Document	100%	C.3.4.1
	X	X	Device Finish 2/	MIL-STD -883	2037		For terminations containing Sn	5 (0)	
2	X		Visual Inspection	MIL-STD -883	2032			100%	C.3.4.2
		X						22 (0)	
3	X		Reflow Conditioning	MIL-PRF -55365	Para. 4.7.10			100%	
	X		Thermal Shock (Unmounted)	MIL-STD -202	Test Method 107	A 3/	-55 to 125C, 5 cycles	100%	
	X		Surge Current (SC)	MIL-PRF -55365	Para. 4.7.18	C		100%	
	X		Weibull FRL Grading	MIL-PRF -55365	Para. 4.7.20	C	Retain test results Read & Record Data	100%	
	X	X	DC Leakage	MIL-PRF -55365	Para. 4.7.6			100%	
								10 (0)	

See footnotes at end of table.

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TABLE D: CHIP CAPACITORS, SOLID TANTALUM (CONTINUED) 1/
(Table C-III-2 of MIL-PRF-38534 L)

Subgroup	Class		Test	Standard or Specification	Method	Condition	Comments	Quantity (accept number)	Reference Paragraph MIL-PRF - 38534	
	K	H								
3	X		Capacitance	MIL-PRF -55365 and MIL-STD -202	Para. 4.7.7		Retain test results Read & Record Data	100%		
		X								
	X			Dissipation Factor	MIL-PRF -55365	Para. 4.7.8				
		X								
	X			ESR	MIL-PRF -55365	Para. 4.7.14				
		X								
X		+3 sigma cull required for DF, ESR, DC Leakage	MIL-PRF -55365		MIL-PRF -55365 1.2.1.6 Table III	Remove parts that fail +3 sigma cull.	100%			
4	X		Radiographic Inspection	MIL-PRF -55365	Para. 3.5			100%		
5	X	-	Stability at low and high temperature	MIL-PRF -55365	Para. 3.19			22 (0)		
6 4/	X	X	Wire Bond Evaluation	MIL-STD -883	2011		For wire bonding applications	10 (0) wires or 20 (1) wires	C.3.4.3 C.3.4.6	
	X	X	Solderability	MIL-STD -202	208		For soldering applications	5(0)		
7	X		Destructive Physical Analysis	MIL-STD -1580				5 (0)		
	X		Life Test	MIL-PRF -55365	Para. 4.7.19	Per Table VI	2000 Hrs at 125C	24 (1)		

1/ For Class H hybrid devices, element evaluation in accordance with this table is not required for capacitors that are compliant to MIL-PRF-55365 and are listed on the QPL. For Class K hybrids, element evaluation in accordance with this table is not required for capacitors procured as QPL MIL-PRF-55365 product level T or product level M with minimum Weibull FRL C combined with surge current option C.
 2/ Using a recognized methodology (e.g. method 2037 of MIL-STD-883, JESD-213) verify that finishes containing Tin (Sn) have a minimum of 3% Lead (Pb) by weight per MIL-PRF-38534. Device finish test may be conducted by hybrid manufacturer upon receipt of components. Device finish test may be conducted following visual inspection at the discretion of the capacitor manufacturer.
 3/ Method 107 of MIL-STD-202 Condition A modified to adjust upper temperature limit to +125 4/ Subgroup 6 tests may be conducted in any order.
 4/ Subgroup 6 tests may be conducted in any order.

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TABLE E: COILS, TRANSFORMERS
(Table C-III-4 of MIL-PRF-38534 L)
Table E applies to purchased magnetics. It does not apply to magnetics made in-house by Crane which are made on a qualified line and do not require additional Element Evaluation.

Subgroup	Class		Test	Standard or Specification	Method	Condition	Comments	Quantity (accept number)	Reference paragraph MIL-PRF - 38534
	K Closed	K Open and Closed ^{1/}							
1	X	X	Element Electrical	Acquisition Document			25° C	100%	C.3.4.1
2	X	X	Visual Inspection	MIL-STD - 883 and MIL-STD -981	2032		MIL-STD -981: 5.5.3, 5.5.9, 5.5.12	100%	C.3.4.2
		X	Visual Inspection	MIL-STD - 883	2032			22(0)	
3	X		Temperature Cycle	MIL-STD - 883	1010	C	10 cycles	10(0)	C.3.4.3
	X		Mechanical Shock or Constant Acceleration ^{2/}	MIL-STD - 883	2002	B	Y1 direction	10(0)	
					2001	A	Y1 direction		
	X		Burn-In	MIL-STD - 981	Section 5.6.7.3.4	Class S	T = Max Rating, 96hrs, Max Load	10(0)	
	X	X	Visual Inspection	MIL-STD - 883 and MIL-STD -981	2032		MIL-STD -981: 5.5.3, 5.5.9, 5.5.12	10(0)	C.3.4.3 C.3.4.5
	X	X	Element Electrical	Acquisition Document				10(0)	C.3.4.3 C.3.4.4

See footnotes at end of table.

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TABLE E: COILS, TRANSFORMERS (CONTINUED)

Table E applies to purchased magnetics. It does not apply to magnetics made in-house by Crane which are made on a qualified line and do not require additional Element Evaluation. (Table C-III-4 of MIL-PRF-38534 L)

Subgroup	Class			Test	Standard or Specification	Method	Condition	Comments	Quantity (accept number)	Reference paragraph MIL-PRF - 38534
	K Closed	K Open <u>1/</u>	H Open and Closed <u>1/</u>							
4 <u>3/</u>	X	X	X	Device Finish	MIL-STD - 883 or JESD 213	2037		Not required for components that contain no solder or tin (e.g., ferrite magnetics with copper wires). Where Applicable	5(0)	
	X	X	X	Wire bondability	MIL-STD - 883	2011		Where Applicable	H-5(0) K-10(0) or 20(1)	C.3.4.3 C.3.4.6
	X	X	X	Solderability	MIL-STD - 883	2003		Where Applicable	H-2(0), K-5(0)	
	X	X	X	Terminal Strength	MIL-STD - 981	Para. 5.6.7.4		Where Applicable	H-2(0), K-5(0)	C.3.4.6

1/Magnetic elements built in house by the hybrid manufacturer may be tested per the Class K open construction requirements or Class H requirements, as applicable. Elements must be qualified with the hybrid and not manufactured for sale as a separate qualified component. Construction techniques and materials must meet or exceed that of MIL-STD-981 (where applicable).

2/Either test method is acceptable.

3/Group 4 tests may be conducted in any order.

