Quality Assurance and Certification

APPLICATION NOTE FOR INTERPOINT® PRODUCTS

The application note is an overview of the Crane quality system for Interpoint® products. It includes a list of certifications and qualifications, an explanation of our model numbering system and tables of the screening levels offered.

QUALITY SYSTEM OVERVIEW–LYNNWOOD AND KAOHSIUNG

• Our Lynnwood and Kaohsiung facilities are on the Defense Logistics Agency's (DLA) Qualified Manufacturers List (QML) of hybrid microcircuits with products compliant up to Class H (Lynnwood and Kaohsiung) and Class K (Lynnwood) of MIL-PRF-38534. Our manufacturing facilities are audited by a US government organization with customer participation. Classes H and K, MIL-PRF-38534 Certificate, Hybrid Microcircuits, FSC 5962, VQ(VQH-21-035667) for Lynnwood.

• The quality management system of Crane Electronics, Inc., Lynnwood and Crane Electronics Corporation, Kaohsiung have been certified to ISO 9001:2015 and AS9100D on certificates 1655 and 1657 by the International Standards Authority, Inc. (www.isaregistrar.com)

• Standard Microcircuit Drawings (SMD) of our DC-DC converters are available to Class H and K of MIL-PRF-38534. DLA Drawing EMI filters are available to Class H and K of MIL-PRF-38534. The government documents may be viewed at https://landandmaritimeapps.dla.mil/programs/smcr/.

• Components and materials used in product assembly are purchased against published revision controlled source control drawings (SCD). Characteristics and allowed suppliers are controlled by specific SCDs. A system is in place to review components and materials prior to stocking. Instruments such as the X-ray fluorescence (XRF) are used to ensure that supplier certifications accurately describe the material. Our high reliability QML products comply with MIL-PRF-38534 specifications, which do not allow the use of pure tin. Our other products may have pure tin. Refer to our "Lead and Other RoHS Materials" letter for more information.

• Documented revision controlled procedures and work instructions are in use for all operations that affect quality.

• Radiation hardness assurance (RHA) levels available referenced to MIL-PRF-38534. Our Lynnwood facility has a DLA approved RHA plan for Interpoint power products. Our SMD products with RHA "P," "L", "R" and "H" levels meet DLA RHA requirements.

• Travelers are used to sequence and control operations at in-process, final and special inspection situations.

• Quality documents are specifically identified and retained as specified in our document control procedure. The standard retention period for critical documents is 15 years.

• Quality manual QA-040 (www.interpoint.com/012) is the controlling document for the quality system.

• Personnel performing quality functions are given the responsibility, authority and organizational freedom to identify and evaluate quality concerns as well as to initiate corrective action.

• Contracts are reviewed to identify and make timely provisions for special or unusual circumstances.

• As a minimum, self audits of the quality system are completed annually.

MIL-PRF-38534
HYBRID MICROCIRCUIT CERTIFICATION
FOR
CLASSES H and K
IS HEREBY AWARDED TO

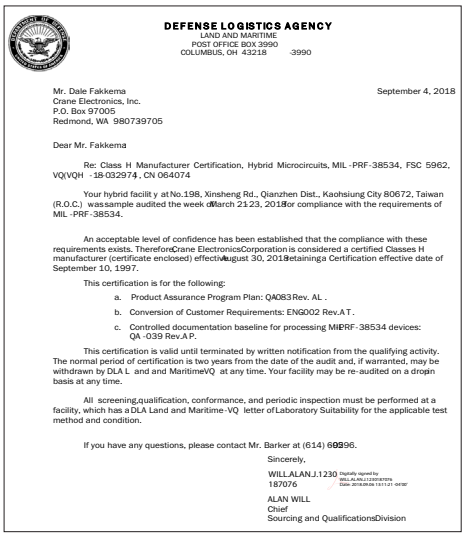
Crane Electronics, Inc.
16700 13th Avenue West
Lynnwood, Washington 98037

THIS CERTIFICATION IS VALID UNTIL TERMINATED BY WRITTEN NOTIFICATION FROM DLA LAND AND MARITIME. REFERENCE DLA LAND AND MARITIME LETTER VQ(VQH-21-035667) FOR DETAILS PERTAINING TO THIS CERTIFICATION.

WILLIAMS.EUGENE.1180650748 Digitally signed by WILLIAMS.EUGENE.1180650748 Date: 2020.11.17 15:21:30 -05'00'

EUGENE WILLIAMS JR.
Director Engineering & Technical Support Directorate (V)
DLA, Land & Maritime

LYNNWOOD CLASS H AND K CERTIFICATE



DEFENSE LOGISTICS AGENCY
LAND AND MARITIME
POST OFFICE BOX 3990
COLUMBUS, OH 43218 3990

Mr. Dale Fakkema
Crane Electronics, Inc.
P.O. Box 97005
Redmond, WA 980739705

September 4, 2018

Dear Mr. Fakkema

Re: Class H Manufacturer Certification, Hybrid Microcircuits, MIL-PRF-38534, FSC 5962, VQ(VQH -18-032974, CN 064074

Your hybrid facility at No.198, Xinsheng Rd., Qianzhen Dist., Kaohsiung City 80672, Taiwan (R.O.C.) was sample audited the week of March 21-23, 2018 for compliance with the requirements of MIL-PRF-38534.

An acceptable level of confidence has been established that the compliance with these requirements exists. Therefore Crane Electronics Corporation is considered a certified Classes H manufacturer (certificate enclosed) effective August 30, 2018 retaining a Certification effective date of September 10, 1997.

This certification is for the following:

a. Product Assurance Program Plan: QA083 Rev. AL.
b. Conversion of Customer Requirements: ENG002 Rev. AT.
c. Controlled documentation baseline for processing MIL-PRF-38534 devices: QA-039 Rev. AP.

This certification is valid until terminated by written notification from the qualifying activity. The normal period of certification is two years from the date of the audit and, if warranted, may be withdrawn by DLA Land and Maritime VQ at any time. Your facility may be re-audited on a drop-in basis at any time.

All screening, qualification, conformance, and periodic inspection must be performed at a facility, which has a DLA Land and Maritime -VQ letter of Laboratory Suitability for the applicable test method and condition.

If you have any questions, please contact Mr. Barker at (614) 692-0396.

Sincerely,

WILLALANJ.1230187076 Digitally signed by WILLALANJ.1230187076 Date: 2018.09.04 13:11:21 -04'00'

ALAN WILL
Chief
Sourcing and Qualifications Division

KAOHSIUNG CLASS H DLA LETTER

Quality Assurance and Certification

APPLICATION NOTE FOR INTERPOINT® PRODUCTS

QUALITY ASSURANCE CERTIFICATIONS AND STANDARDS LYNNWOOD AND KAOHSIUNG

• ANSI/ESD S20.20—Electrostatic Discharge Control Program. We use a multi-level ESD damage prevention approach including operator training, continuously monitoring wrist grounding-straps, static dissipative smocks for personnel, static dissipative work surfaces and floors, air ionizers at work stations and faraday cages for parts movement.

• ANSI/IPC-A-600—Acceptability of Printed Boards

• ANSI/IPC-A-610—Acceptability of Electronic Assemblies. The Lynnwood facility has IPC-610 certified operators.

• ANSI-Z540—Calibration Laboratories and Measuring and Test Equipment—General Requirements

• ASQC-Z1.4—Procedures, Sampling and Tables for Inspection by Attributes

• ISO 9001/AS9100 Quality Systems—Model for quality assurance in design, development, production, installation, and servicing. Lynnwood and Kaohsiung facilities are registered with International Standards Authority (ISA) accredited by ANAB.

• ISO 14644—Cleanrooms and Controlled Environments. Particle count monitoring, laminar flow benches and contamination preventing smocks for personnel all contribute to maintaining the required levels of cleanliness.

• MIL-STD-883—Test Method Standard for Microcircuits

• MIL-PRF-38534—Hybrid Microcircuits, General Specifications for

• Quality Certification—Employees who work with products are individually certified in the required skills. Training and certification are documented and records are maintained. Inspectors are tested for color vision and visual acuity.

• QML-38534—Qualified Manufacturer's List of Products Qualified under Performance Specification MIL-PRF-38534 Hybrid Microcircuits, General Requirements for

• Restriction of Hazardous Substances (RoHS), Waste Electrical and Electronic Equipment (WEEE) and Registration, Evaluation, and Authorization of Chemicals (REACh) are addressed in "Lead and Other RoHS Materials".

IPC
ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES®

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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

PART NUMBERING Our part numbering indicates the series (family), input voltage, output voltage, number of outputs, package configuration and screening level. The screening and RHA levels found in this Quality Assurance document appear at the right end of the part number. Products with standard screening do not have a screening level in the part number: e.g. MTR2812D is the MTR Series™ 28 volt input (nominal), ±12 volt outputs, flanged package and standard screening. Refer to individual datasheets to determine what screening options are available for a particular product. Screening methods are referenced to MIL-STD-883 per MIL-PRF-38534.

The example shows an MTR, 28 Vin, ±12 Vout, flanged case with /883 (Class H) screening. MTR2812D/883 is a model in the MTR Series™.

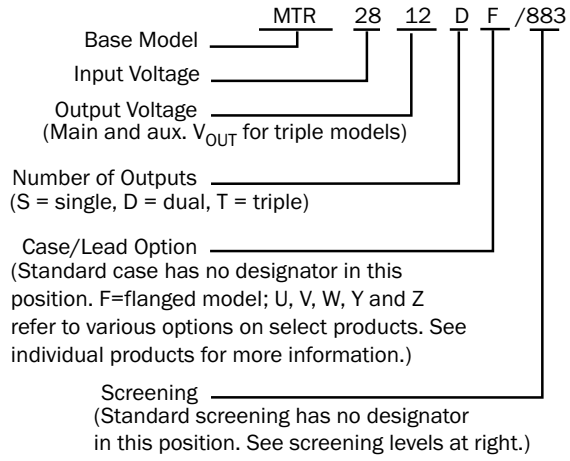
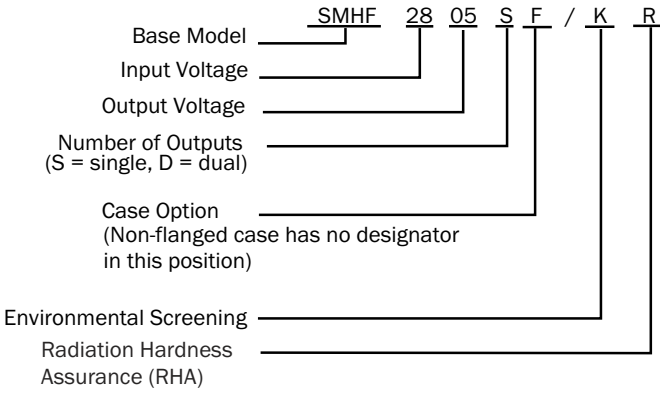


Table 1: Environmental Screening (non Space)	
Screening (/)	Description
883	Class H, QML, has an SMD number, marked with "QML". Class H, QML, products that do not have an SMD number, marked with "CH". Qualified by similarity.
SX [1, 2]	MIL-STD-883 screening, non QML, marked with "SX".
ES [2]	Extended screening, per the product's datasheet.
Standard [2]	Standard screening, per the product's datasheet.

1. "SX'" screening is only available on specific models. Refer to the Series' datasheet.
2. Non-compliant products may not meet all of the requirements of MIL-PRF-38534.

The example below shows an SMHF, 28 Vin, +5 Vout, flanged case, Class K screening and RHA level R. SMHF2805SF/KR is a model in the SMHF Series™.



If ordering by model number add a "-Q" to request solder dipped leads (e. g. SMHF2805SF/KR-Q).

Table 2: Screening and RHA Levels, Space Products	
Level	Description of Levels
KR	Class K, QML, RHA level R, 100 krad(Si)
KL	Class K, QML, RHA level L, 50 krad(Si)
KP	Class K, QML, RHA level P, 30 krad(Si)
HR	Class H, QML, RHA level R, 100 krad(Si)
HL	Class H, QML, RHA level L, 50 krad(Si)
HP	Class H, QML, RHA level P, 30 krad(Si)
KH	Class K, QML, filters only RHA level H [1]
HH	Class H, QML, filters only RHA level H [1]
BR	Class K screening, non-QML[2], RHA level R, 100 krad(Si)
BL	Class K screening, non-QML[2], RHA level L, 50 krad(Si)
BP	Class K screening, non-QML[2], RHA level P, 30 krad(Si)
AR	Class H screening, non-QML[2], RHA level R, 100 krad(Si)
AL	Class H screening, non-QML[2], RHA level L, 50 krad(Si)
AP	Class H screening, non-QML[2], RHA level P, 30 krad(Si)
OO	Space prototype, screening (non-QML[2]) per the product's datasheet. "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.

Notes
1. RHA "H" applies to filters only. Our EMI filters are designed with passive components providing maximum tolerance for space environment requirements. RHA "H" is defined as radiation tolerant up to 1000 krad(Si) total dose.
2. Non-QML products "O" may not meet all of the requirements of MIL-PRF-38534.

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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

SCREENING TABLES

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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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

Table is for reference only. See individual Series' datasheets for specific screening.

SPACE RADIATION HARDNESS ASSURANCE DC-DC CONVERTERS CLASS H AND K, RHA [1] P, L AND R

	QML [2]					
	CLASS H			CLASS K		
QUALIFICATION PER MIL-STD	/HP	/HL	/HR	/KP	/KL	/KR
RHA P: 30 krad(Si) total dose [3, 4]	■			■		
RHA L: 50 krad(Si) total dose [3, 4]		■			■	
RHA R: 100 krad(Si) total dose [3, 4]			■			■
SEE, LET 86 MeV cm^2/mg [5]	■	■	■	■	■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. DLA has approved the RHA plan for Interpoint power products. Our SMD products with RHA "P", "L" or "R" code meet DLA requirements.
2. Class H or K QML products that have no SMD number are marked "CHP, CHL, CHR, CKP, CKL or CKR" per MIL-PRF-38534, Table III instead of "QML".
3. Radiation sensitive components internal to the devices are procured with radiation guarantees or undergo radiation lot acceptance testing (RLAT) performed per condition A, method 1019 of MIL-STD-883.
4. Representative devices were initially High Dose Rate (HDR) tested using condition A of method 1019 of MIL-STD 883 to ensure RHA designator levels. Representative devices have also been Low Dose Rate (LDR) tested using condition D of method 1019 of MIL-STD-883 to the RHA designator levels. Representative devices will also be re-tested after design or process changes that can affect RHA response of this device.
5. Single event testing was performed on a converter to 86 MeV-cm^2/mg using 15 MeV/nucleon gold ions with no latch-up, burn-out, functional interrupts, or gate ruptures exhibited. Single event upsets (output voltage transients) may be present up to 86 MeV-cm^2/mg.

TABLE 2: SPACE RADIATION HARDNESS ASSURANCE DC-DC CONVERTERS CLASS H AND K, RHA P, L AND R

TABLE 3: ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS PROTOTYPE, CLASS H AND K

Quality Assurance and Certification

APPLICATION NOTE FOR INTERPOINT® PRODUCTS

Table is for reference only. See individual Series' datasheets for specific screening.

ENVIRONMENTAL SCREENING SPACE EMI FILTERS PROTOTYPE, CLASS H AND K, RHA [1] H

	NON-QML [2]	QML [3, 4]	
	PROTOTYPE [5]	CLASS H	CLASS K
TEST PERFORMED	/OO [6]	/HH [6]	/KH [6]
Pre-cap Inspection, Method 2017, 2032	■	■	■
Temperature Cycle (10 times)			
Method 1010, Cond. C, -65°C to +150°C, ambient	■	■	■
Constant Acceleration, Method 2001, 3000 g	■	■	■
PIND, Test Method 2020, Cond. A		■ [7]	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■	■
Burn-in Method 1015, +125°C case, typical [8]			
96 hours	■		
160 hours		■	
2 x 160 hours (includes mid-BI test)			■
Final Electrical Test, MIL-PRF-38534, Group A,			
Subgroups 1 and 4: +25°C case	■		
Subgroups 1 through 6, -55°C, +25°C, +125°C case		■	■
Hermeticity Test, Method 1014			
Gross Leak, Cond. B_2, Kr85			■
Gross Leak, Cond. C_1, fluorocarbon	■	■	
Fine Leak, Cond. B_1, Kr85			■
Fine Leak, Cond. A_2, helium	■	■	
Radiography, Method 2012			■
Post Radiography Electrical Test, +25°C case			■ [7]
Final visual inspection			
Method 2009 of MIL-STD-883		■	■
Magnification 1X [9]	■		
Radiation tolerance [1, 10]			
Passive components, radiation tolerant		■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. DLA has approved the RHA plan for Interpoint power products. Our SMD products with RHA "H" code meet DLA requirements.
2. Non-QML products, prototype (OO), may not meet all of the requirements of MIL-PRF-38534.
3. All processes are QML qualified and performed by certified operators.
4. Class H or K QML products that have no SMD number are marked "CHH, CKH" per MIL-PRF-38534, Table III instead of "QML".
5. "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA
6. Our EMI filters are designed exclusively with passive components providing maximum tolerance for space environment requirements.
7. Not required by DLA but performed to assure product quality.
8. Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
9. Visual inspection is performed per an internal document. Product may contain cosmetic irregularities such as dents, dings, scratches, etc. that do not affect form, fit or function.
10. Interpoint EMI filters are designed exclusively with passive components providing maximum tolerance for space environment requirements. RHA level H is guaranteed to 1000 krad(Si).

TABLE 4: SPACE RADIATION HARDNESS ASSURANCE DC-DC CONVERTERS CLASS H AND K, RHA P, L AND R

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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

Table is for reference only. See individual Series' datasheets for specific screening.

ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS PROTOTYPE, A AND B.

	NON-QML [1, 2]		
	PROTOTYPE	A	B
TEST PERFORMED	/OO [3]	/A [7]	/B [7]
Non-destruct wire bond pull, Method 2023		■ [4]	■
Pre-cap Inspection, Method 2017, 2032	■	■	■
Temperature Cycle (10 times)			
Method 1010, Cond. C, -65°C to +150°C, ambient	■	■	■
Constant Acceleration			
Method 2001, 3000 g	■	■	■
PIND, Test Method 2020, Cond. A		■ [4]	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■ [4]	■
Burn-in Method 1015, +125°C case, typical [5]			
96 hours	■		
160 hours		■	
2 x 160 hours (includes mid-BI test)			■
Final Electrical Test, MIL-PRF-38534, Group A,			
Subgroups 1 and 4: +25°C case	■		
Subgroups 1 through 6, -55°C, +25°C, +125°C case		■	■
Hermeticity Test, Method 1014			
Gross Leak, Cond. B_2, Kr85			■
Gross Leak, Cond. C_1, fluorocarbon	■	■	
Fine Leak, Cond. B_1, Kr85			■
Fine Leak, Cond. A_2, helium	■	■	
Radiography, Method 2012			■
Post Radiography Electrical Test, +25°C case			■ [4]
Final visual inspection, Method 2009			
Method 2009 of MIL-STD-883		■	■
Magnification 1X [6]	■		

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. Non-QML prototype products may not meet all of the requirements of MIL-PRF-38534.
2. All processes are QML qualified and performed by certified operators. A and B are only available on select models.
3. "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.
4. Not required by DLA but performed to assure product quality.
5. Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
6. Visual inspection is performed per an internal document. Product may contain cosmetic irregularities such as dents, dings, scratches, etc. that do not affect form, fit or function.
7. Parts are manufactured and screened to MIL-PRF-38534 but have not passed Group C requirements.

TABLE 5: ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS PROTOTYPE, A AND B

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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

Table is for reference only. See individual Series' datasheets for specific screening.

SPACE RADIATION HARDNESS ASSURANCE SCREENING DC-DC CONVERTERS A AND B, RHA [1] P, L AND R

	NON-QML [2]					
	A			B		
QUALIFICATION PER MIL-STD	/AP	/AL	/AR	/BP	/BL	/BR
RHA P: 30 krad(Si) total dose [3,4]	■			■		
RHA L: 50 krad(Si) total dose [3,4]		■			■	
RHA R: 100 krad(Si) total dose [3,4]			■			■
SEE, LET 86 MeV cm^2/mg [5]	■	■	■	■	■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes

1. DLA has approved the RHA plan for Interpoint power products. Our SMD products with RHA "P", "L" or "R" code meet DLA requirements.
2. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
3. Radiation sensitive components internal to the devices are procured with radiation guarantees or undergo radiation lot acceptance testing (RLAT) performed per condition A, method 1019 of MIL-STD-883.
4. Representative devices were initially High Dose Rate (HDR) tested using condition A of method 1019 of MIL-STD 883 to ensure RHA designator levels. Representative devices have also been Low Dose Rate (LDR) tested using condition D of method 1019 of MIL-STD-883 to the RHA designator levels. Representative devices will also be re-tested after design or process changes that can affect RHA response of this device.
5. Single event testing was performed on a converter to 86 MeV-cm^2/mg using 15 MeV/nucleon gold ions with no latch-up, burn-out, functional interrupts, or gate ruptures exhibited. Single event upsets (output voltage transients) may be present up to 86 MeV-cm^2/mg.

TABLE 6: SPACE RADIATION HARDNESS ASSURANCE DC-DC CONVERTERS A AND B NON-QML RHA P, L AND R

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Table is for reference only. See individual Series' datasheets for specific screening.

ENVIRONMENTAL SCREENING STANDARD AND /ES [1]

TEST PERFORMED	STANDARD	/ES
Pre-cap Inspection Method 2017, 2032	■	■
Temperature Cycle (10 times) Method 1010, Cond. B, -55°C to +125°C, ambient		■
Constant Acceleration Method 2001, 500 g		■
Burn-in Method 1015 [2] 96 hours		■
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	■	■
Hermeticity Test, Method 1014		
Gross Leak, Cond. C_1, fluorocarbon		■
Fine Leak, Cond. A_2, helium		■
Gross Leak, Dip	■	
Final visual inspection Method 2009	■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. Standard and /ES products may not meet all of the requirements of MIL-PRF-38534.
2. Burn-in temperature designed to bring the case temperature to the maximum case temperature of the product. Refer to the specific product information for the maximum case temperature. Burn-in is a powered test.

TABLE 5: ENVIRONMENTAL SCREENING STANDARD AND /ES

TABLE 7: ENVIRONMENTAL SCREENING SPACE EMI FILTERS PROTOTYPE, CLASS H AND K, RHA H

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Table is for reference only. See individual Series' datasheets for specific screening.

Environmental Screening High Reliability Standard, /ES, /SX and /883 (Class H)

Test Performed	non-QML [1]			Class H QML [2]	
	Standard	/ES	/SX	/883 CH [3]	/883 QML [4]
Pre-cap Inspection, Method 2017, 2032	■	■	■	■	■
Temperature Cycle (10 times)					
Method 1010, Cond. C, -65°C to +150°C, ambient			■	■	■
Method 1010, Cond. B, -55°C to +125°C, ambient		■			
Constant Acceleration					
Method 2001, 3000 g			■	■	■
Method 2001, 500 g		■			
PIND, Test Method 2020, Cond. A			■ [5]	■ [5]	■ [5]
Burn-in Method 1015, +125°C case, typical [6]					
96 hours		■			
160 hours			■	■	■
Final Electrical Test, MIL-PRF-38534, Group A,					
Subgroups 1 through 6, -55°C, +25°C, +125°C case			■	■	■
Subgroups 1 and 4, +25°C case	■	■			
Hermeticity Test, Method 1014					
Gross Leak, Cond. C_1, fluorocarbon		■	■	■	■
Fine Leak, Cond. A_2, helium		■	■	■	■
Gross Leak, Dip	■				
Final visual inspection, Method 2009	■	■	■	■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. All processes are QML qualified and performed by certified operators.
3. Class H QML products with no SMD number are marked “CH” per MIL-PRF-38534, 3.9.5.8.3, Table III.
4. Class H QML products have an SMD number

Table 8: Environmental Screening High Reliability DC-DC Converters and EMI Filters Standard, /ES, /SX and /883 (Class H)

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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]

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.

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
2		X	Element Visual	MIL-STD -883	2010	B		100%	C.3.3.2
	X		Element Visual	MIL-STD -883	2010	A			
3		X	Internal Visual	MIL-STD -883	2010	B		10(0)	C.3.3.3
	X		Internal Visual	MIL-STD -883	2010	A			C.3.3.4.2
4	X		Initial Electrical	Per Acquisition Document			25°C Record Data	10(0)	
	X		Temperature Cycle	MIL-STD -883	1010	C	20 Cycles		C.3.3.3
	X		Mechanical Stress 1/	MIL-STD -883 - Constant Acceleration	2001	A	Y1 Direction		
				MIL-STD -883 - Mechanical Shock	2002	B	Y1 Direction		
	X		Interim Electrical	Per Acquisition Document			25°C Record Data		C.3.3.4.3
	X		Burn-In 2/	MIL-STD -883	1015		240hrs Min. at Tc or Ta = 125ºC Min.		
	X		Post-BI Electrical 3/	Per Acquisition Document			25°C, -55°C, 125°C Record Data		C.3.3.4.3
	X		Steady State Life 2/	MIL-STD -883	1005		1000hrs at Tc or Ta =125°C Min. or 500hrs at Tc=150°C Min.		
	X	X	Final Electrical 3/	Per Acquisition Document			25°C, -55°C, 125°C Record Data		C.3.3.4.3
5	X	X	Wirebond Evaluation 4/	MIL-STD -883	2011		Bake for 1 hour minimum @ +300ºC (Bimetallic bonds only)	10(0) or 20(1) wires	C.3.3.3 C.3.3.5
6	X		SEM 5/	MIL-STD -883	2018			See 5/	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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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

TABLE B: SEMICONDUCTOR DICE EVALUATION REQUIREMENTS

(Table C-II-1 of MIL-PRF-38534 L)

*Interpoint Products do no have SCR components

Subgroup	Class K	Class H	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
1	X	X	Element Electrical	X	X	X	X	X	X	Per Acquisition Document			25°C	100%	C.3.3.1
2	X	X	Element Visual					X		MIL-STD-750	2069			100%	C.3.3.2
	X	X		X							2070				
	X	X		X	X				X		2072				
	X	X				X	X				2073				
3	X	X	Internal Visual					X		MIL-STD-750	2069			10(0)	C.3.3.3
	X	X		X							2070				C.3.3.4.2
	X	X		X	X				X		2072				
	X	X				X	X				2073				
4	X		Initial Electrical 1/	X	X	X	X	X	X	Per Acquisition Document			25°C Record Data	10(0)	
	X		Temperature Cycle 2/	X	X	X	X	X	X	MIL-STD-883	1010	C	20 Cycles		C.3.3.3
	X			X	X	X	X	X	X	MIL-STD-750	1051	C	20 Cycles		
	X		Surge			X				MIL-STD-750	4066	B			
	X						X					A			

See footnotes at end of table.

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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

TABLE B: SEMICONDUCTOR DICE EVALUATION REQUIREMENTS (CONTINUED)

(Table C-II-1 of MIL-PRF-38534 L)

*Interpoint Products do no have SCR components

Subgroup	Class K	Class H	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
4	X		Mechanical Stress 2/	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	MIL-STD -883 - Mechanical Shock	2002	B	Y1 Direction		
										MIL-STD -750 - Mechanical Shock	2016		Y1 Direction 1500g		
	X		Interim Electrical 1/	X	X	X	X	X		Per Acquisition Document			25°C Record Data		C.3.3.4.3
	X		High Temperature Reverse Bias (HTRB) 3/	X	X					MIL-STD -750	1039	A	80% Min. of rated VCB (bipolar), as applicable.		C.3.3.3
	X							X		MIL-STD -750 - Burn-in (Power MOSFET) MIL-STD -750 - Gate Bias (IGBT)	1042	B	80% Min. of rated VGS.		
	X					X	X			MIL-STD -750 - Burn-in (Power) MIL-STD -750 - 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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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

TABLE B: SEMICONDUCTOR DICE EVALUATION REQUIREMENTS (CONTINUED)

(Table C-II-1 of MIL-PRF-38534 L)

*Interpoint Products do no have SCR components

Subgroup	Class K	Class H	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
4	X		Interim Electrical 1/ 3/	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	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 1/ 4/	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 acquistion 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.

APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

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	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	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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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

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.

APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

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 Aquisition Document	100%	C.3.4.1
2	X	X	Device Finish 2/	MIL-STD -883	2037		For terminations containing Sn	5 (0)	
	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		DC Leakage	MIL-PRF -55365	Para. 4.7.6			100%	
		X						10 (0)	

See footnotes at end of table.

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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

TABLE D: CHIP CAPACITORS, SOLID TANTALUM (CONTINUED) 1/

(Table C-III-2 of MIL-PRF-38534 L)

Subgroup	Class K	Class H	Test	Standard or Specification	Method	Condition	Comments	Quantity (accept number)	Reference Paragraph MIL-PRF - 38534
3	X		Capacitance	MIL-PRF -55365 and	Para. 4.7.7		Retain test results Read & Record Data	100%	
		X		MIL-STD -202	305			10 (0)	
	X		Dissipation Factor	MIL-PRF -55365	Para. 4.7.8			100%	
		X						10 (0)	
	X		ESR	MIL-PRF -55365	Para. 4.7.14			100%	
		X						10 (0)	
	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)	
	X		Destructive Physical Analysis	MIL-STD -1580				5 (0)	
7	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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APPLICATION NOTE FOR INTERPOINT® PRODUCTS

APPENDIX A - ELEMENT EVALUATION TABLES

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 1/	H Open and Closed 1/							
1	X	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	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	X	Element Electrical	Acquisition Document				10(0)	C.3.4. 3 C.3.4.4

See footnotes at end of table.

TABLE E: COILS, TRANSFORMERS (CONTINUED)

(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 1/	H Open and Closed 1/							
4 3/	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).	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.

