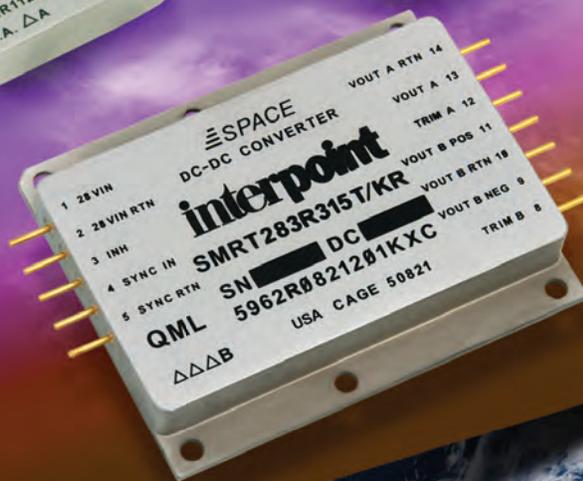
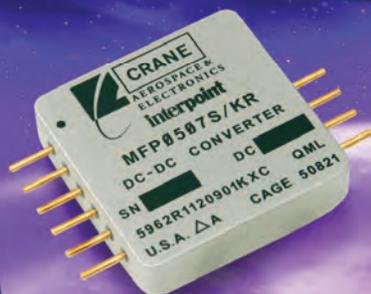


# Power Solutions

Interpoint® DC-DC Converters  
and EMI Filters

## Space Catalog



Crane Aerospace & Electronics  
Power Solutions  
Interpoint® DC-DC Converters and EMI Filters  
**Space Catalog**



This document contains information within the purview of the Export Administration Regulations (EAR), 15 CFR 730-774. The products in this document have been officially classified as EAR99, no license required, with the exception of 100 krad(Si) products which are ECCN 9A515.e.1.

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Power Solutions – Interpoint® Products  
Space Catalog Rev K 2015.11.05  
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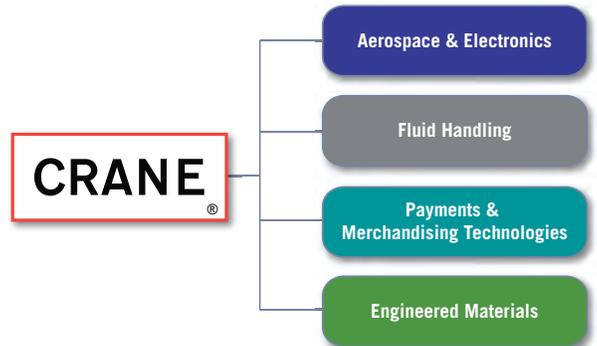
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# Company Information

## Crane Co.

Founded in 1855, Crane Co. is a diversified manufacturer of highly engineered industrial products with a substantial presence in a number of focused markets, with over 11,000 employees at over 150 locations working together across 26 countries. The Company has four business segments: Aerospace & Electronics, Fluid Handling, Payments & Merchandising Technologies, and Engineered Materials. Crane Co. is traded on the New York Stock Exchange (NYSE: CR). For more information, please visit [www.craneco.com](http://www.craneco.com).



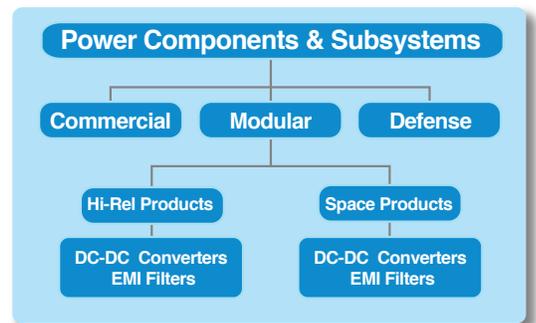
## Crane Aerospace & Electronics

Crane Aerospace & Electronics delivers proven systems, reliable components and flexible power solutions that excel in tough environments, from engines and landing gear to satellites, missiles and electronic countermeasure devices. Products and services are organized into six integrated solutions for aerospace and defense applications, including Sensing Components & Systems, Fluid Management, Power Components & Subsystems, Landing Gear Systems, Cabin Systems, and Microwave Components & Integrated Systems. For more information, visit [www.craneeae.com](http://www.craneeae.com).

## Power Components & Subsystems

Crane is a provider of high quality, rugged power products with nearly 60 years of experience in power conversion, management, monitoring and energy storage. We offer a full line of off-the-shelf and custom power solutions for the commercial aerospace, defense and space markets for applications in avionics, communications, electronic countermeasures, missiles, radar, navigation, guidance and utility systems. A trusted industry leader in power and advanced packaging solutions, our ELDEC<sup>®</sup>, Interpoint<sup>®</sup> and Keltec<sup>®</sup> brand products meet the requirements for flight and mission critical applications while delivering the efficiency and reliability that our customers demand.

From the Mars Science Lab to commercial aircraft, missiles to fighter aircraft, our range of power products include custom, semi-custom or off-the-shelf products have proven their ability to operate in the most demanding environments. Our quality systems ensure reliable, repeatable, processes and performance.



## Modular Power – Space Qualified DC-DC Converters and EMI Filters

Our Interpoint space qualified dc-dc converters and EMI filters are installed on the power systems of the Mars Exploration Rovers, Mars Science Laboratory, Phoenix Lander, Hubble Space Telescope, Cassini-Huygens, Orion and other out-of-this-world applications. These converters are built for extreme environments: available as Class H or K of MIL-PRF-38534 on Standard Microcircuit Drawings (SMD) with Radiation Hardness Assurance (RHA) levels of "O" (prototypes) with no RHA level, "P" 30 krad(Si), "L" 50 krad(Si) or "R" 100 krad(Si). Single Event Effects (SEE) Linear Energy Transfer (LET) performance to MeV cm<sup>2</sup>/mg.

Our EMI Filters are designed exclusively with passive components providing maximum tolerance for extreme space environment requirements. They are available with RHA level O (no RHA) or RHA level "H" 1000 krad(Si).

## Power Solutions

Power Solutions offers ELDEC, Interpoint and Keltec brand power conversion, power distribution and battery systems for the commercial aerospace, defense and space for use in avionics, ATA Chapter 24 Power Systems, communications, electronic countermeasures, missiles, radar, navigation, guidance and utility systems. Our power products, which are well known for high performance and high reliability, have proven performance in military/defense, aerospace, space and industrial applications. From modular power supplies to custom-designed power sub-systems, we can deliver what you need. Our range of power offerings include custom, semi-custom or off-the-shelf products. Our quality systems ensure reliable, repeatable, processes and performance.

## DC-DC Converters and EMI Filters

Interpoint dc-dc converter and EMI filter modules have proven performance in extreme environments where high reliability is required and failure is not an option. They are ideal for aerospace, military/defense, space, medical and industrial applications. We offer a standard line of high reliability dc-dc power converters fully qualified up to Class K, QML of MIL-PRF-38534. To meet demanding time and cost targets, choose a product from the standard converters and filters. Over 1,000 off-the-shelf high-reliability dc-dc power conversion products are available. For more information please visit [www.craneae.com/interpoint](http://www.craneae.com/interpoint).

## Space Qualified DC-DC Converters and EMI Filters

Our Interpoint space qualified dc-dc converters and EMI filters are in the power systems of the Mars Rovers, Mars Science Laboratory, Phoenix Lander, Hubble Space Telescope, Cassini-Huygens and other out-of-this-world applications.

The converters are available as Class H or K of MIL-PRF-38534 on Standard Microcircuit Drawings (SMD) with Radiation Hardness Assurance (RHA) levels of "O" (prototypes) with no RHA level, "P" 30 krad(Si), "L" 50 krad(Si) or "R" 100 krad(Si). Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg

Our EMI Filters are designed exclusively with passive components providing maximum tolerance for space environment requirements. They are available with RHA level O (no RHA) or RHA level "H" 1000 krad(Si).



# Interpoint DC-DC Converters and EMI filters Overview

## Interpoint Product Overview

### High Temperature Operation

High temperature ceramic capacitors and all-metal thermally-conductive cases provide full power operation over DLA's Class H and K temperature range of -55° to +125°C.

### Constant Frequency Design

Our proprietary pulse-width-modulated forward converter design produces constant frequency operation and excellent transient response.

### Full Hermeticity

Hermetically sealed cases provide optimum protection for all components ensuring high reliability operation in harsh environments.

### Advanced Performance

Advanced magnetics and our patented Asymmetrical Power Transfer provides high power density, high efficiency and low height.

### Standard Military Drawings

Our dc-dc converters are available on Standard Microcircuit Drawings (SMD) and EMI filters are available on DLA Drawings.



## Innovative Solutions

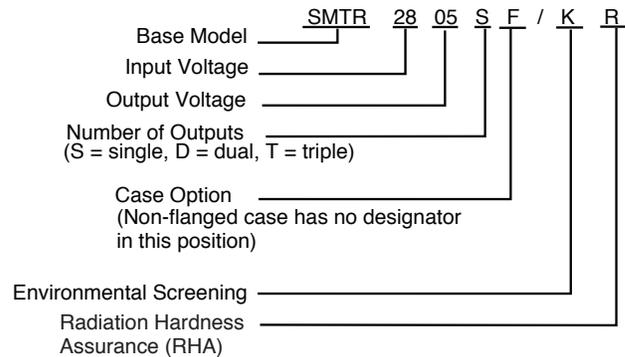
With over forty years of experience, we are your first source for power conversion products for high reliability applications. We have provided innovative power solutions for space aerospace, military/defense and industrial applications where size, weight and reliability are critical to program success. Our space products are available as prototype (OO), Class H-QML or Class K-QML. The products are classified as EAR99 with the exception of 100 krad (RHA R) products. Our space dc-dc converters are rated to 86 MeV cm<sup>2</sup>/mg for single event effects (SEE) linear event transfer (LET) performance.

## Standard Power Conversion

We offer a standard line of dc-dc power converters fully qualified up to MIL-PRF-38534 Class H or K, QML. To meet demanding time and cost targets, choose a product from the standard converters and filters. We offer over 1,000 power conversion products.

## Part Numbering

Our part numbering indicates the series (family), input voltage, output voltage, number of outputs, package configuration, screening and radiation hardness assurance (RHA) level.



## Technical Support

Applications Engineers are available to provide technical support by phone or email. Call +1 425-882-3100, option 7; email [powerapps@crane-eg.com](mailto:powerapps@crane-eg.com). For the fastest response to a voice message or email please include your name, company name, a phone number, the model number and a brief statement of the problem.



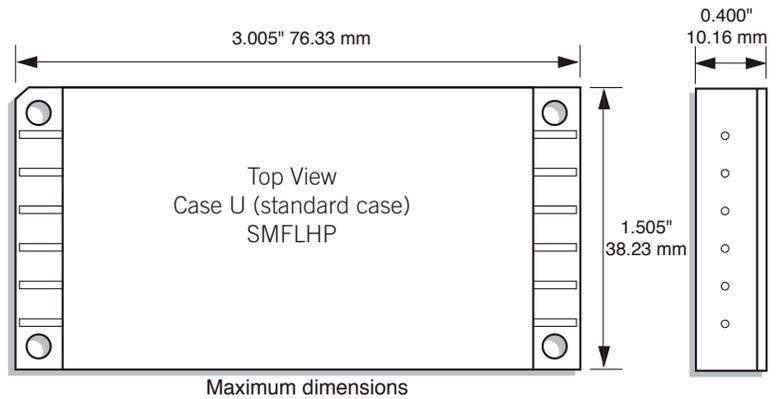
# Interpoint Space Qualified DC-DC Converters

## SMFLHP SERIES™ CONVERTERS—100 WATT

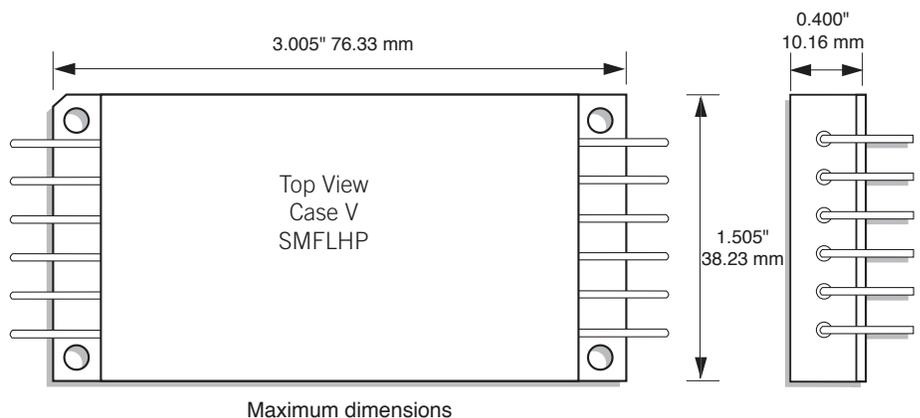
- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Parallel up to 3 converters—maximum recommended power is 80% of the total available power.
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 19 to 40 volts
- Transient protection up to 80 volts for 50 ms
- Converter will shut down at an input voltage above approximately 45 volts
- Fully isolated, magnetic feedback
- Fixed high switching frequency
- Remote sense and output trim on single output models
- Primary and secondary inhibit function
- Synchronization input and output
- Indefinite short circuit protection
- High power density with up to 87% typical efficiency

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
SMFLHP283R3S	19 to 40	3.3	16.00	53	72
SMFLHP2805S	19 to 40	5	16.00	80	80
SMFLHP2812S	19 to 40	12	7.50	90	86
SMFLHP2815S	19 to 40	15	6.67	100	87
SMFLHP2805D	19 to 40	±5	16.00 <sup>1</sup>	80 <sup>1</sup>	80
SMFLHP2812D	19 to 40	±12	7.50 <sup>1</sup>	90 <sup>1</sup>	86
SMFLHP2815D	19 to 40	±15	6.67 <sup>1</sup>	100 <sup>1</sup>	87

1. Up to 70% of the total power is available from either output providing the opposite output is carrying at least 30% of the power in use. The specification shown is the maximum total current/power.



The SMFLHP Series uses a unique dual loop feedback technique that controls output current with an inner feedback loop and output voltage with a cascaded voltage mode feedback loop. The additional secondary current mode feedback loop improves transient response in a manner similar to primary current mode control and allows for ease of paralleling. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. Radiation tolerant, with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables 1 and 2 on page 16 and page 17. For the most current specifications refer to the SMFLHP datasheet at [www.interpoint.com/S01](http://www.interpoint.com/S01).



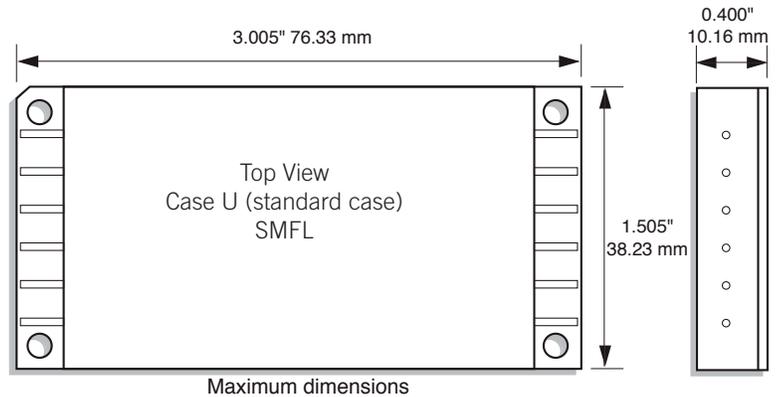
# Interpoint Space Qualified DC-DC Converters

## SMFL SERIES™ CONVERTERS—65 WATT

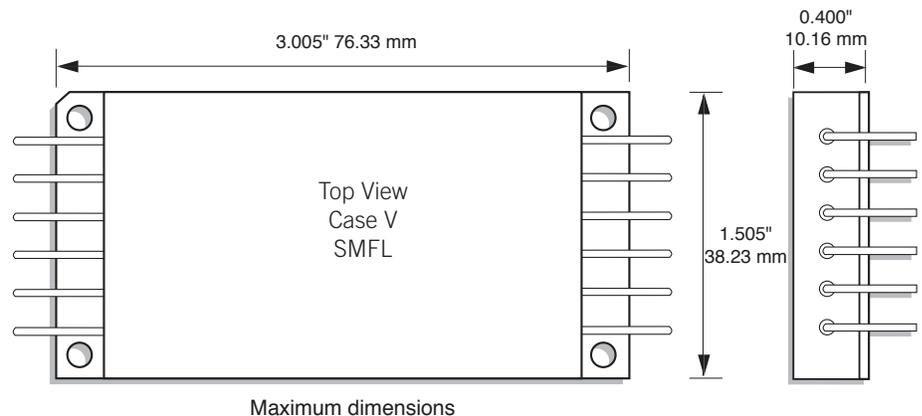
- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Parallel up to 3 converters—maximum recommended power is 80% of the total available power.
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 16 to 40 volts
- Transient protection up to 80 volts for 50 ms
- Converter will shut down at an input voltage above approximately 45 volts
- Fully isolated, magnetic feedback
- Fixed high switching frequency
- Remote sense and output trim on single output models
- Primary and secondary inhibit function
- Synchronization input and output
- Indefinite short circuit protection
- High power density with up to 85% typical efficiency

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
SMFL283R3S	16 to 40	3.3	12.12	40	72
SMFL2805S	16 to 40	5	10.00	50	78
SMFL2812S	16 to 40	12	5.00	60	84
SMFL2815S	16 to 40	15	4.33	65	85
SMFL2805D	16 to 40	±5	10.00 <sup>1</sup>	50 <sup>1</sup>	78
SMFL2812D	16 to 40	±12	5.00 <sup>1</sup>	60 <sup>1</sup>	84
SMFL2815D	16 to 40	±15	4.33 <sup>1</sup>	65 <sup>1</sup>	85

1. Up to 70% of the total current/power is available from either output providing the opposite output is carrying at least 30% of the power in use. The specification shown is the maximum total current/power.



The SMFL Series converters have two inhibit terminals (INH1—primary side and INH2—secondary side) that can be used to disable power conversion, resulting in a very low quiescent input current and no generation of switching noise. The SMFL uses a unique dual loop feedback technique that controls output current with an inner feedback loop and an output voltage with a cascaded voltage mode feedback loop. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. Radiation tolerant, with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the SMFL datasheet at [www.interpoint.com/SØ2](http://www.interpoint.com/SØ2).



# Interpoint Space Qualified DC-DC Converters

## SMRT28 SERIES™ CONVERTERS—35 WATT SINGLE, DUAL OR TRIPLE

- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Built in MIL-STD-461 EMI filter
- Output trim from 51% to 124% of nominal
- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 19 to 56 volts
- Transient protection 80 volts for 120 ms
- Fully isolated, 5 port isolation
- Dual magnetic feedback
- Fixed high frequency switching
- Remote sense
- Inhibit function
- Synchronization input
- Indefinite short circuit protection
- Meets MIL-STD-704A transient standards

Two independent feedback loops are used to regulate the dual and triple outputs, one feedback loop regulates the two-phased single output. Each set of outputs is electrically isolated from the other and from the input. This product configuration eliminates cross regulation effects between output sets.

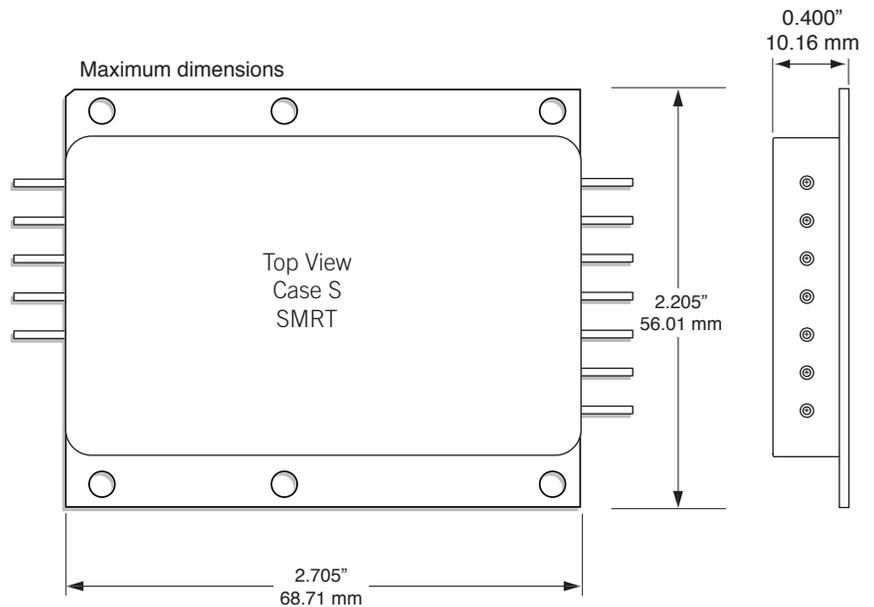
### Configurations:

- Single Output: One dual-phase output
- Dual Output: Two isolated single-phase outputs
- Triple Output: One single-phased output (Main) isolated from one single-phase dual output (± Auxiliary)

The output voltage of each set can be trimmed upward or downward by as much as 51% to 124% of nominal. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. Radiation tolerant, with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the SMRT28 datasheet at [www.interpoint.com/SØ3](http://www.interpoint.com/SØ3).

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ. )
SMRT283R3S	19 to 56	3.3	6.97	23	64
SMRT2805S	19 to 56	5	6.00	30	71
SMRT288R7S	19 to 56	8.7	4.00	35	75.5
SMRT2812S	19 to 56	12	2.92	35	78
SMRT2815S	19 to 56	15	2.33	35	80
SMRT2805D	19 to 56	±5	±3.00 <sup>1</sup>	30	70
SMRT2812D	19 to 56	±12	±1.46 <sup>1</sup>	35	76
SMRT2815D	19 to 56	±15	±1.17 <sup>1</sup>	35	80
SMRT283R312T	19 to 56	3.3 & ±12	4.50 1.25 <sup>2</sup>	30	70.5
SMRT283R315T	19 to 56	3.3 & ±15	4.50 1.00 <sup>2</sup>	30	71
SMRT28507T	19 to 56	5 & ±7	3.00 2.00 <sup>2</sup>	29	71
SMRT28512T	19 to 56	5 & ±12	3.00 1.25 <sup>2</sup>	30	75
SMRT28515T	19 to 56	5 & ±15	3.00 1.00 <sup>2</sup>	30	75

1. The specified maximum current is available from each output.
2. Up to the maximum specified auxiliary output current is available from either auxiliary output provided the total auxiliary output power does not exceed 15 watts. The specification shown is the maximum total current/power.



# Interpoint Space Qualified DC-DC Converters

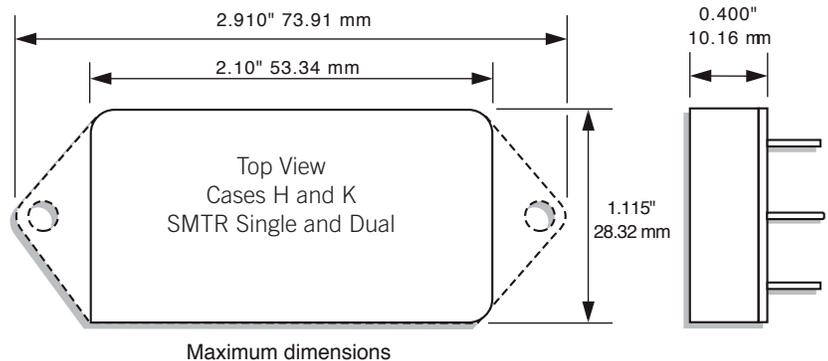
## SMTR SERIES™ CONVERTERS—30 WATT

- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 16 to 40 volts
- Transient protection 50 volts for 50 ms
- Fully isolated, magnetic feedback
- Fixed high frequency switching, 600 kHz typical
- Trim function or remote sense on single output models
- Inhibit and synchronization functions
- Indefinite short circuit protection
- Typical efficiency up to 83%

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
SMTR283R3S	16 to 40	3.3	5.45	18	73
SMTR2805S	16 to 40	5	5.00	25	78
SMTR2812S	16 to 40	12	2.50	30	83
SMTR2815S	16 to 40	15	2.00	30	83
SMTR2805D	16 to 40	±5	5.00 <sup>1</sup>	25 <sup>1</sup>	76
SMTR2812D	16 to 40	±12	2.50 <sup>1</sup>	30 <sup>1</sup>	80
SMTR2815D	16 to 40	±15	2.00 <sup>1</sup>	30 <sup>1</sup>	81

1. Up to 90% of the total current/power is available from either dual output, providing the opposite output is carrying at least 10% of the power in use. The specification shown is the maximum total current/power.

The SMTR Series™ of 28 volt dc-dc converters offers up to 30 watts of output power from single or dual output configuration. They operate over the full military temperature range of -55° to +125°C with up to 84% efficiency. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. Radiation tolerant, with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the SMTR datasheet at [www.interpoint.com/S04](http://www.interpoint.com/S04).



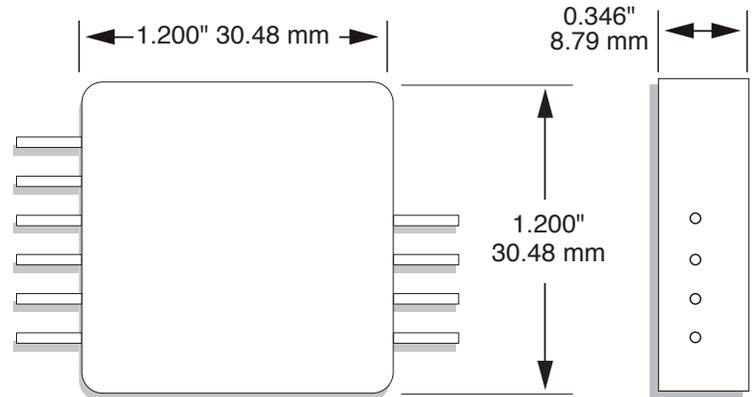
# Interpoint Space Qualified DC-DC Converters

## MFP SERIES™ POINT OF LOAD CONVERTER

- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 85 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- No external components required
- Up to 92% typical efficiency, flat down to 30% load
- Qualified up to MIL-PRF-38534 Class K
- Input voltage range 3.0 to 6.0 volts dc
- Input transient survivability to 15 volts for up to 1 sec.
- Inhibit and sync functions
- Current monitoring,
- Current sharing pin for parallel operation
- Four pin-selectable, preset voltages: 0.8, 1.6, 2.5 and 3.3
- Output voltage continuously adjustable from 0.8 to 3.5 volts with resistors
- Indefinite output short circuit protection
- Remote sense and voltage margining

MODEL	INPUT (V) <sup>1, 2</sup>	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.) <sup>3</sup>
MFPO507S	3.0 min. to 6.0 max	0.8	7	5.6	73
	3.0 min. to 6.0 max	1.6	6.4	10.2	84
	3.3 min to 6.0 max.	2.5	5.0	12.5	89
	4.5 min to 6.0 max.	3.3	5.0	16.5	92

1. 0.64 VDC is an additional pin selectable voltage.
2. Continuously adjustable from 0.8 to 3.5 VDC.
3. Efficiency at 25°C.



Maximum dimensions

Flatness of base: 0.003 inch per inch

The MFP Series™ of dc-dc converters do not require any external components to achieve all specified performance levels. They are a high-reliability, high-efficiency point of load converter for use with a 3.3 or a 5 volt input bus. The MFPO507S model has the flexibility to be set for any output voltage from 0.64 to 3.5 volts. The converter operates from an input of 3.0 to 6.0 V<sub>IN</sub> with an undervoltage shutdown below 3 volts and an overvoltage shutdown above 6 volts. The converter can withstand up to a 15 volt transient for up to 1 second.

The non-isolated, feature-rich MFP uses a Buck converter design with synchronous rectification. The design allows the unit to operate synchronously to no output load, ensuring high efficiency at the lightest loads without switching off the synchronous devices. Important features include a solid state switch, inrush current limiting, synchronization with an external system clock and the ability to current share allowing multiple devices to supply a common load. Radiation tolerant, with a radiation hardness assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the MFP datasheet at [www.interpoint.com/mfp](http://www.interpoint.com/mfp).

# Interpoint Space Qualified DC-DC Converters

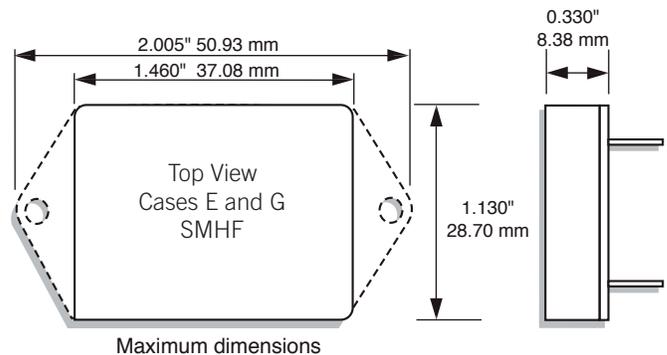
## SMHF SERIES™ CONVERTERS—15 WATTS

- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 16 to 45 volts
- Transient protection 50 volts for 50 ms
- Fully isolated
- Fixed high frequency switching
- Inhibit function
- Synchronization input
- Indefinite short circuit protection
- Undervoltage lockout

The SMHF Series™ synchronization feature allows the user to match the switching frequency of the converter to the frequency of the system clock. This allows the user to adjust the nominal 550 kHz operating frequency to any frequency within the range of 500 kHz to 600 kHz by applying a compatible input of the desired frequency to pin 5. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. Radiation tolerant, with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the SMHF datasheet at [www.interpoint.com/SØ5](http://www.interpoint.com/SØ5).

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
SMHF283R3S	16 to 45	3.3	2.40	8	71
SMHF2805S	16 to 45	5	2.40	12	76
SMHF285R2S	16 to 45	5.2	2.40	12.5	78
SMHF2812S	16 to 45	12	1.25	15	79
SMHF2815S	16 to 45	15	1.00	15	78
SMHF2805D	16 to 45	±5	2.40 <sup>1</sup>	12 <sup>1</sup>	77
SMHF2812D	16 to 45	±12	1.25 <sup>1</sup>	15 <sup>1</sup>	80
SMHF2815D	16 to 45	±15	1.00 <sup>1</sup>	15 <sup>1</sup>	82

1. Up to 70% of the total current/power is available from either dual output, providing the opposite output is carrying at least 30% of the power in use. The specification shown is the maximum total current/power.



# Interpoint Space Qualified DC-DC Converters

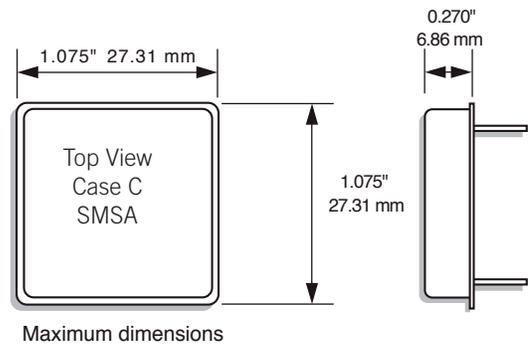
## SMSA SERIES™ CONVERTERS—5 WATT

- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 16 to 40 volts
- Transient protection 50 volts for 50 ms
- Fully isolated, Inhibit function
- High power density, up to 74% typical efficiency

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
SMSA283R3S	16 to 40	3.3	1.20	4	65
SMSA2805S	16 to 40	5	1.00	5	74
SMSA285R2S	16 to 40	5.2	0.962	5	74
SMSA2812S	16 to 40	12	0.417	5	74
SMSA2815S	16 to 40	15	0.333	5	74
SMSA2805D	16 to 40	±5	1.00 <sup>1</sup>	5 <sup>1</sup>	70
SMSA2812D	16 to 40	±12	0.417 <sup>1</sup>	5 <sup>1</sup>	73
SMSA2815D	16 to 40	±15	0.333 <sup>1</sup>	5 <sup>1</sup>	73

1. Up to 80% of the total current/power is available from either dual output, providing the opposite output is carrying at least 20% of the power in use. The specification shown is the maximum total current/power.

The SMSA Series™ provides excellent dynamic response and noise rejection. SMSA converters inhibit feature can disable internal switching resulting in low standby current and no generation of switching noise. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. Radiation tolerant, with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the SMSA datasheet at [www.interpoint.com/S06](http://www.interpoint.com/S06).



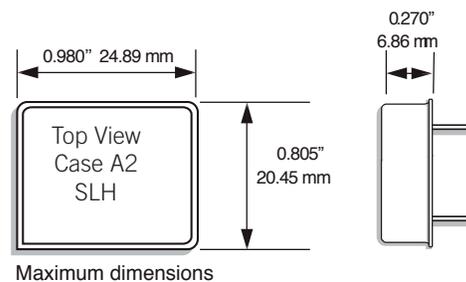
## SLH SERIES™ CONVERTERS—1.5 WATT

- Radiation tolerant space dc-dc converter
  - Single event effects (SEE) LET performance to 86 MeV cm<sup>2</sup>/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) L = 50 krad(Si), R = 100 krad(Si)
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 16 to 40 V
- Transient protection 50 V for 50 ms
- Fully isolated magnetic feedback
- Inhibit function

MODEL	INPUT (V)	OUTPUT AT FULL LOAD			
		OUTPUT (V)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
SLH2805S	16 to 40	5	0.300	1.5	79
SLH2812S	16 to 40	12	0.125	1.5	87
SLH2815S	16 to 40	15	0.100	1.5	88
SLH2805D	16 to 40	±5	0.300 <sup>1</sup>	1.5 <sup>1</sup>	75
SLH2812D	16 to 40	±12	0.125 <sup>1</sup>	1.5 <sup>1</sup>	87
SLH2815D	16 to 40	±15	0.100 <sup>1</sup>	1.5 <sup>1</sup>	87

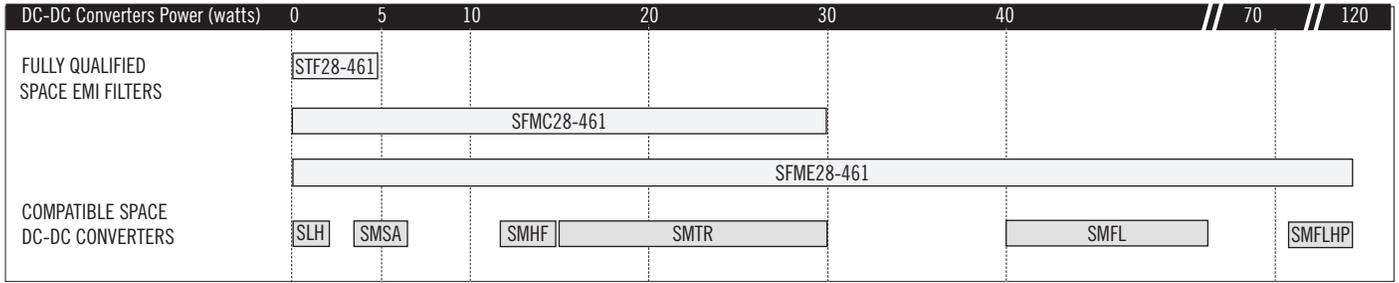
1. Up to 80% of the total current/power is available from either dual output, providing the opposite output is carrying at least 20% of the power in use. The specification shown is the maximum total current/power.

At just 0.79 square inches, the SLH Series™ of 28 V dc-dc converters delivers 1.5 watts of power while saving significant board area. Connecting the load between positive and negative outputs on the dual models, leaving the common unconnected, results in double the output voltage. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening with a Radiation Hardness Assurance (RHA) level available up to "R" per MIL-PRF-38534. See Screening Tables on page 16 and page 17. For the most current specifications refer to the SLH datasheet at [www.interpoint.com/S07](http://www.interpoint.com/S07).



# Interpoint Space Qualified EMI Filters

## EMI FILTER GUIDE



All filters may be used with multiple converters up to the rated current of the filter.

Model	Input Voltage (V)	Current (Max. A)	Minimum Attenuation (dB) @ 500 kHz	Screening	Compatible Converter
SFME28-461	0 - 50	10.0	60	Prototype (O) non-QML, Class H-QML or K-QML Tables 5 and 6	SMFLHP, SMFL, SMTR, SMHF, SMSA, SLH
SFMC28-461	0 - 50	2.7	55	Prototype (O) non-QML, Class H-QML or K-QML Tables 5 and 6	SMTR, SMHF, SMSA, SLH
STF28-461	0 - 50	0.8	50	Prototype (O) non-QML, Class H-QML or K-QML Tables 5 and 6	SMSA, SLH

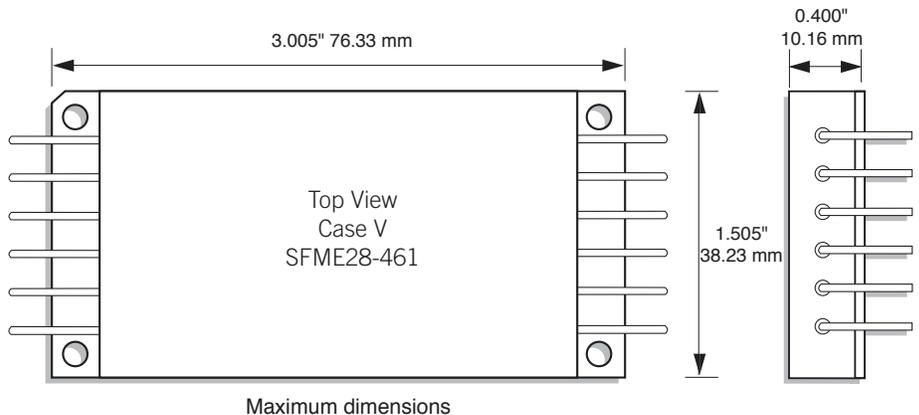
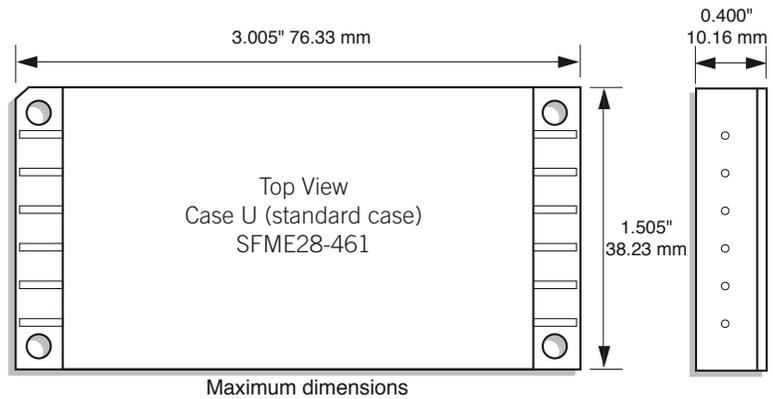
# Interpoint Space Qualified EMI Filters

## SFME28-461™ EMI FILTER—10 AMPS

- Radiation tolerant space EMI filter
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) H, 1000 krad(Si)
  - Passive components used for maximum tolerance in space environments
- Attenuation 70 dB at 500 kHz and 1 MHz, typical
- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and
- Nominal 28 V input, 0 V to 50 V operation
- Up to 10 A throughput current
- Compliant to MIL-STD-461C CE-03
- Compatible with MIL-STD-704 A-E 28 VDC power bus

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
SFME28-461	0 to 50	10	60 dB @ 500 kHz and 1 MHz	SMFLHP, SMFL, SMTR

The SFME28-461™ EMI filter modules are designed to reduce the reflected input ripple current of high frequency dc-dc converters. These filters are intended for use in 28 volt applications which require MIL-STD-461 levels of conducted emissions. One filter can be used with multiple converters up to the rated throughput current of the filter. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. See Screening Tables on page 18 and page 19. For the most current specifications refer to the SFME28-461 datasheet at [www.interpoint.com/SF1](http://www.interpoint.com/SF1).

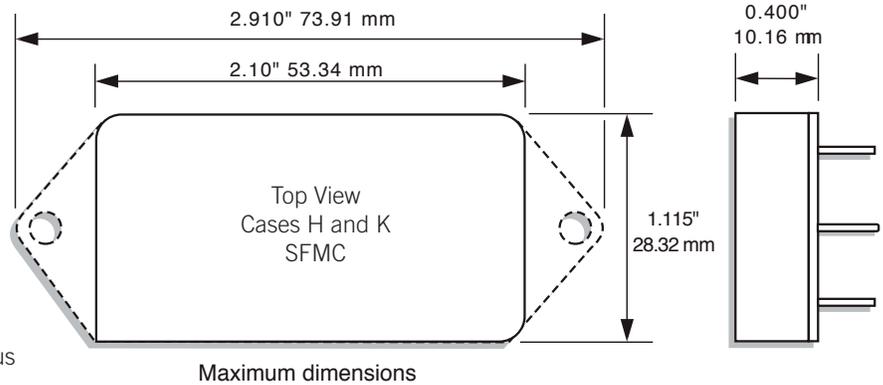


# Interpoint Space Qualified EMI Filters

## SFMC28-461™ EMI FILTER—2.7 AMPS

- Radiation tolerant space EMI filter
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) H, 1000 krad(Si)
  - Passive components used for maximum tolerance in space environments
- Attenuation 55 dB minimum at 500 kHz
- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Nominal 28 V input, 0 V to 50 V operation
- Up to 2.7 A throughput current
- Compliant to MIL-STD-461C CE-03
- Compatible with MIL-STD-704 B-E 28 VDC power bus

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
SFMC28-461	0 to 50	2.7	55 dB @ 500 kHz 60 dB @ 1 and 5 MHz	SMTR, SMHF, SMSA, SLH

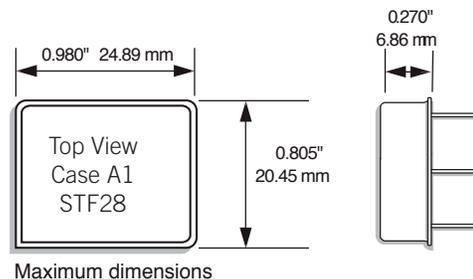


All SFMC28-461™ filters designated level O, indicating standard environmental screening, are electrically comparable to filters designated level K, the highest environmental screening level. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. See Screening Tables on page 18 and page 19. For the most current specifications refer to the SFMC28-461 datasheet at [www.interpoint.com/SF3](http://www.interpoint.com/SF3).

## STF28-461™ EMI FILTER—0.8 AMPS

- Radiation tolerant space EMI filter
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) H, 1000 krad(Si)
  - Passive components used for maximum tolerance in space environments
- Attenuation 50 dB minimum at 500 kHz
- Small size, 0.79 in<sup>2</sup> (5.1 cm<sup>2</sup>)
- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Nominal 28 V input, 0 V to 50 V operation
- Up to 0.8 A throughput current
- Compliant to MIL-STD-461C CE-03
- Compatible with MIL-STD-704 A-E 28 VDC power bus

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
STF28-461	0 to 50	0.8	50 dB @ 500 kHz and 1 MHz	SMSA, SLH



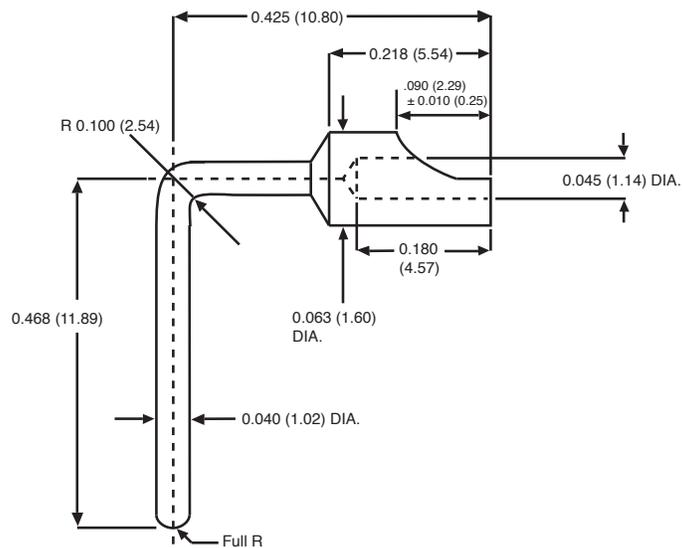
The STF28-461™ EMI filter module has been designed for use with the SMSA flyback power converters. Multiple SMSA power converters can be operated from a single filter provided the total power line current does not exceed the filter maximum rating. The STF filter will reduce the SMSA's power line reflected ripple current to the limits of MIL-STD-461C CE-03. Available with Space Prototype (non-QML), Class H-QML and Class K-QML Quality Assurance screening. See Screening Tables on page 18 and page 19. For the most current specifications refer to the STF28-461 datasheet at [www.interpoint.com/SF4](http://www.interpoint.com/SF4).

# PIN Terminal Adaptor

## PIN TERMINAL ADAPTOR

- Adapts Interpoint flanged, side-leaded cases to up-leaded or down-leaded configurations
- Compatible with many families of Interpoint products for use in high reliability applications
- Low resistance
- Copper alloy with solder plating over nickel

Our side-leaded packages can be adapted with PIN terminal adapters to fit a variety of configurations. These versatile adapters slide over the ends of side-leaded package terminals and are intended to be soldered to the leads to provide an up-leaded or down-leaded configuration. For the most current specifications refer to the PIN datasheet at [www.interpoint.com/PIN](http://www.interpoint.com/PIN).



Drawing enlarged to show detail



Actual size

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

## ELEMENT EVALUATION SPACE DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K

COMPONENT-LEVEL TEST PERFORMED	NON-QML <sup>1</sup>	QML			
	PROTOTYPE	CLASS H		CLASS K	
	/O	/H		/K	
	M/S <sup>2</sup>	M/S <sup>2</sup>	P <sup>3</sup>	M/S <sup>2</sup>	P <sup>3</sup>
Element Electrical	■	■	■	■	■
Visual		■	■	■	■
Internal Visual		■		■	
Temperature Cycling				■	■
Constant Acceleration				■	■
Interim Electrical				■	
Burn-in				■	
Post Burn-in Electrical				■	
Steady State Life				■	
Voltage Conditioning Aging					■
Visual Inspection					■
Final Electrical		■	■	■	■
Wire Bond Evaluation		■	■	■	■
SEM				■	
C-SAM: Input capacitors only <sup>4</sup>			■		■

### Notes

1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. M/S = Active components (microcircuit and semiconductor die)
3. P = Passive components, Class H and K element evaluation. Not applicable to space prototype ("O") element evaluation.
4. Additional test not required by H or K.

### Definitions:

Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534

SEM: scanning electron microscopy

C-SAM: C – Mode Scanning Acoustic Microscopy

Screening Table 1: Element Evaluation—DC-DC Converters Prototype, Class H and Class K

# Interpoint Quality Assurance Screening

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

## ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K, RHA<sup>1</sup> P, L AND R

TEST PERFORMED	NON-QML <sup>2</sup>	QML <sup>3</sup>					
	PROTOTYPE	CLASS H			CLASS K		
	/OO <sup>4</sup>	/HP	/HL	/HR	/KP	/KL	/KR
Non-destruct wire bond pull, Method 2023		■ <sup>5</sup>	■ <sup>5</sup>	■ <sup>5</sup>	■	■	■
Pre-cap Inspection, Method 2017, 2032	■	■	■	■	■	■	■
Temperature Cycle (10 times) (Qual 100 times) Method 1010, Cond. C, -65°C to +150°C, ambient	■	■	■	■	■	■	■
Constant Acceleration Method 2001, 3000 g (Qual 5000 g)	■	■	■	■	■	■	■
PIND, Test Method 2020, Cond. A		■ <sup>5</sup>	■ <sup>5</sup>	■ <sup>5</sup>	■	■	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■ <sup>5</sup>	■ <sup>5</sup>	■ <sup>5</sup>	■	■	■
Burn-in Method 1015, +125°C case, typical <sup>6</sup>							
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 <sub>2</sub> , Kr85					■	■	■
Gross Leak, Cond. C <sub>1</sub> , fluorocarbon	■	■	■	■			
Fine Leak, Cond. B <sub>1</sub> , Kr85					■	■	■
Fine Leak, Cond. A <sub>2</sub> , helium	■	■	■	■			
Radiography, Method 2012					■	■	■
Post Radiography Electrical Test, +25°C case					■ <sup>5</sup>	■ <sup>5</sup>	■ <sup>5</sup>
Final visual inspection, Method 2009	■	■	■	■	■	■	■
RHA P: 30 krad(Si) total dose <sup>1, 7, 8</sup>		■			■		
RHA L: 50 krad(Si) total dose <sup>1, 7, 8</sup>			■			■	
RHA R: 100 krad(Si) total dose <sup>1, 7, 8</sup>				■			■
SEE, LET 86 MeV cm <sup>2</sup> /mg <sup>1, 9</sup>		■	■	■	■	■	■

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

- Notes
- Our Redmond facility has a DLA approved RHA plan for Interpoint power products. Our SMD products with RHA "P", "L" or "R" code meet DLA requirements.
  - Non-QML prototype products may not meet all of the requirements of MIL-PRF-38534.
  - All processes are QML qualified and performed by certified operators.
  - "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.
  - Not required by DLA but performed to assure product quality.
  - Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
  - High dose rate test.
  - Low dose rate test.
  - No destructive events or SEL.

Screening Table 2: Environmental Screening and RHA-DC-DC Converters Prototype, Class H and Class K

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

## ELEMENT EVALUATION SPACE EMI FILTERS PROTOTYPE, CLASS H AND CLASS K

COMPONENT-LEVEL TEST PERFORMED	NON-QML <sup>1</sup>	QML	
	PROTOTYPE	CLASS H	CLASS K
	/O	/H	/K
		P <sup>2</sup>	P <sup>2</sup>
Element Electrical	■	■	■
Visual		■	■
Temperature Cycling			■
Constant Acceleration			■
Voltage Conditioning Aging			■
Visual Inspection			■
Final Electrical		■	■

### Notes

1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. P = Passive components, Class H and K element evaluation.

### Definitions:

Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534

Screening Table 5: Element Evaluation–EMI Filters Prototype, Class H and Class K

# Interpoint Quality Assurance Screening

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

## ENVIRONMENTAL SCREENING SPACE EMI FILTERS PROTOTYPE, CLASS H AND CLASS K, MIL-PRF-38534 AND RHA<sup>1</sup>

TEST PERFORMED	NON-QML <sup>2</sup>	QML <sup>3</sup>	
	PROTOTYPE <sup>4</sup>	CLASS H	CLASS K
	/OO <sup>5</sup>	/HH <sup>5</sup>	/KH <sup>5</sup>
<b>Pre-cap Inspection, Method 2017, 2032</b>	■	■	■
<b>Temperature Cycle (10 times)</b> (Qual 100 times) Method 1010, Cond. C, -65°C to +150°C, ambient	■	■	■
<b>Constant Acceleration</b> Method 2001, 3000 g (Qual 5000 g)	■	■	■
<b>PIND, Test Method 2020, Cond. A</b>		■ <sup>6</sup>	■
<b>Pre burn-in test, Group A, Subgroups 1 and 4</b>	■	■	■
<b>Burn-in Method 1015, +125°C case, typical<sup>7</sup></b>			
96 hours	■		
160 hours		■	
2 x 160 hours (includes mid-BI test)			■
<b>Final Electrical Test, MIL-PRF-38534, Group A,</b>			
Subgroups 1 and 4: +25°C case	■		
Subgroups 1 through 6, -55°C, +25°C, +125°C case		■	■
<b>Hermeticity Test, Method 1014</b>			
Gross Leak, Cond. B <sub>2</sub> , Kr85			■
Gross Leak, Cond. C <sub>1</sub> , fluorocarbon	■	■	
Fine Leak, Cond. B <sub>1</sub> , Kr85			■
Fine Leak, Cond. A <sub>2</sub> , helium	■	■	
<b>Radiography, Method 2012</b>			■
<b>Post Radiography Electrical Test, +25°C case</b>			■ <sup>6</sup>
<b>Final visual inspection, Method 2009</b>	■	■	■
<b>Radiation tolerant<sup>1, 8</sup></b>			
Passive components, radiation tolerant by design		■	■

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

### Notes

- Our Redmond facility has a DLA approved RHA plan for Interpoint power products.
- Non-QML prototype products may not meet all of the requirements of MIL-PRF-38534.
- All processes are QML qualified and performed by certified operators.
- "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.
- Our EMI filters are designed exclusively with passive components providing maximum tolerance for space environment requirements.
- Not required by DLA but performed to assure product quality.
- Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
- Interpoint EMI filters are designed exclusively with passive components providing maximum tolerance for space environment requirements.

Screening Table 6: Environmental Screening and RHA—EMI Filters Prototype, Class H and Class K

# Locations

## Redmond Operations

### Interpoint brand

#### All space products are built in Redmond

Redmond, Washington, USA

Facility: 81,000 square feet

Founded: 1969

### Quality Certifications

- SO 9001:2008/AS9100-B
- Defense Logistics Agency's (DLA, formerly DSCC) MIL-PRF-38534 Qualified Manufacturers List (QML)
- NASA's Preferred Parts List (PPL)
- Products qualified to Class H-QML and Class K-QML

Our Redmond facility was one of the first manufacturers to certify to class K, QML, per MIL-PRF-38534 and to qualify a Class K, QML, hybrid dc-dc converter to a Standard Microcircuit Drawing. This followed in the tradition of being one of the first manufacturers to certify to Class H per MIL-STD-1772.

Our dc-dc converters and EMI filters are well known for their reliable performance in military/aerospace applications and in the far reaches of space.



### Redmond, Washington, USA

10301 Willows Road NE

Redmond, Washington 98052

Tel: +1 425-882-3100

Fax: +1 425-882-1990

Email: [power@crane-eg.com](mailto:power@crane-eg.com)

URL: [www.craneae.com/interpoint](http://www.craneae.com/interpoint)

## Kaohsiung Operations

Kaohsiung, Taiwan

Facility: 20,000 square feet

Founded: 1983

### Quality Certifications

- SO 9001:2008/AS9100-B
- Defense Logistics Agency's (DLA, formerly DSCC) MIL-PRF-38534 Qualified Manufacturers List (QML)
- Products qualified to Class H-QML



### Kaohsiung, Taiwan

# Interpoint Quality Systems and Certifications

## Quality Systems Overview–Redmond and Kaohsiung

- The quality management system of Crane Electronics, Inc., Redmond and Kaohsiung has been certified to ISO9001 and AS9100B, file numbers 1623564, 1623565 and 1623567. The quality management system of Crane Electronics, Inc., in Saint Gratien, France and Yateley, UK has been certified to ISO9001, file numbers 1623563 and 1623562. The quality management system is certified by QMI-SAI Global. Visit [www.qmi-saiglobal.com](http://www.qmi-saiglobal.com) for more information. Our certification is listed at [www.qmi-saiglobal.com/qmi\\_companies](http://www.qmi-saiglobal.com/qmi_companies). We are listed under Crane Electronics (Redmond and Kaohsiung) and Interpoint (France and UK).
- Our Redmond and Kaohsiung facilities are on the DLA's Qualified Manufacturers List (QML) of hybrid microcircuits with products compliant up to Class H (Redmond and Kaohsiung) and Class K (Redmond) of MIL-PRF-38534. Our quality systems, manufacturing processes and facilities are audited by a U.S. government organization with customer participation.
- Standard Microcircuit Drawings (SMD) 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 <http://www.landandmaritime.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 SCD. 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 to MIL-PRF-38534 specifications which do not allow the use of pure tin. Refer to our "Lead and Other RoHS Materials" letter for more information. [www.interpoint.com/011](http://www.interpoint.com/011).
- Documented revision controlled procedures/work instructions are in use for all operations that affect quality.
- Radiation Hardness Assurance (RHA) levels, referenced to MIL-PRF-38534, are available for select products. Our Redmond facility has a DLA approved RHA plan for Interpoint power products. Our SMD products with RHA "P," "L," "R" and "H" level meet DLA 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](http://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.



**ISO 9001**  
**AS 9100**  
QMI-SAI Global  
1623564  
1623565



# Interpoint Quality Systems and Certifications

## Certifications, Qualifications and Standards—Redmond 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 Redmond 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 9001:2008/AS9100C—Quality Systems. Model for quality assurance in design, development, production, installation, and servicing. Redmond and Kaohsiung facilities are registered with QMI-SAI Global for ISO 9001:2008/AS9100C.
- 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" available at [www.interpoint.com/011](http://www.interpoint.com/011)



## Radiation Tolerance: Radiation Hardness Assurance (RHA)

Radiation hardness assurance (RHA) refers to the levels specified in MIL-PRF-38534, Appendix G and indicates the levels of radiation products or components will withstand. Our Redmond facility has a DLA approved RHA plan.

Our model numbers use an "O" in the RHA designator position to indicate the "-" (dash) RHA level of MIL-PRF-38534, which is defined as "no RHA."

The RHA levels offered are:

RHA LEVEL	TOTAL IONIZING DOSE (TID) rad(Si)
O	(NA)
P	30 k
L	50 k
R	100 k
H	1,000 k (EMI filters only)

## Some of the major programs which use our products:

### GEO/LEO Satellites

Amazonas  
Aquarius  
CloudSat  
Direct TV  
EchoStar  
Environmental Mapping and Analysis Program – EnMAP  
eRosita – extended ROentgen Survey with an Imaging Telescope Array  
Express  
FormoSat  
Galileo GPS (ESA)  
Geostationary Lightning Mapper – GLM  
Geostationary Operational Environmental Satellites – GOES  
Global Change Observation Mission – GCOM  
Global Navigation Satellite System – GLONASS  
GONETS LEOSAT System  
Gravity Recovery and Interior Lab – GRAIL  
Hubble Space Telescope  
Ice Cloud and Land Elevation Satellite – ICESat  
India Remote Sensing Satellite – IRS  
Intelsat  
International Gamma Ray and Astrophysics Lab – INTEGRAL

International Space Station – ISS  
Joint Polar Satellite System – JPSS  
Kepler  
Landsat  
Malaysia East Asia Satellite – MEASAT  
Meteor-M  
NASA Polar  
Nimiq  
Optus  
Proba  
QuetzSat  
Resource-DK 1  
Resource-P  
Stratospheric Aerosol and Gas Experiment III-ISS – SAGE  
SES  
Soil Moisture Active Passive – SMAP  
Spectrum-Roentgen-Gamma – SRG  
Telstar  
TerreStar  
Thor  
ViaSat  
Wind Mission

### Crew Equipment and Vehicles

Advanced Neutron Spectrometer  
Orion Multi-Purpose Crew Vehicle – MPCV

### Land Observatory

Chandra X-Ray Observatory

### Launch Vehicles and Support

Ariane 4 and 5  
Cyclone 4  
Cygnus  
Epsilon  
H2A  
Geosynchronous Satellite Launch Vehicle – GSLV  
Proton-M  
Polar Satellite Launch Vehicle – PLSV  
Spacelift Range System – SLRS  
Vega

### Mars

ExoMars Trace Gas Orbiter – TGO  
Mars Exploration Rovers – MER  
Mars Reconnaissance Orbiter – MRO  
Mars Science Lab – MSL, Curiosity

### Solar System

Cassini-Huygens – Saturn  
Dawn – Solar System  
SWaP – Pluto, on New Horizons

### Sun

Jason Webb Space Telescope - JWST  
Solar Orbiter - SoLO

## Crane Aerospace & Electronics

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