

# Power Solutions

Interpoint™ DC/DC Converters  
and EMI Filters

## HIGH RELIABILITY Catalog



Crane Aerospace & Electronics  
**Power Solutions**  
**Interpoint DC/DC Converters and EMI Filters**  
**High Reliability Catalog**

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Crane Aerospace & Electronics  
Power Solutions - Interpoint Products  
High Reliability Catalog Rev G 2012.02.06  
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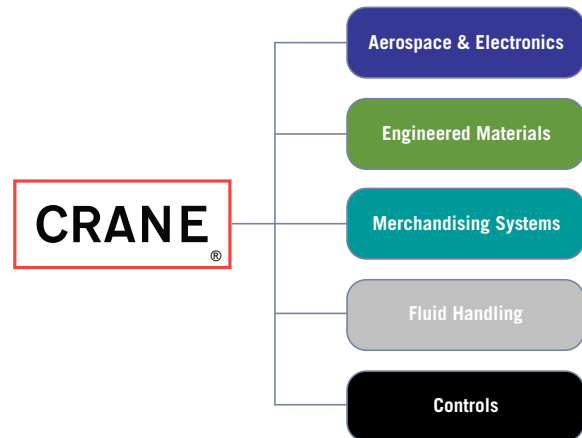
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## TABLE OF CONTENTS

<b>Company Information</b> .....	1
<b>Power Solutions</b> .....	2-3
<b>Facilities - Standard Power</b> .....	4
 <b>High Reliability DC/DC Converters and EMI Filters</b>	
DC/DC Converters and EMI Filters Overview .....	5
DC/DC Converters Quality Systems and Certifications .....	6
High Reliability DC/DC Converters: Selection Chart .....	7
Point of Load Converters (POL) .....	8
High Reliability DC/DC Converters: Products .....	9 - 16
High Reliability EMI Filters: Selection Chart .....	17
High Reliability EMI Filters: Products .....	18 - 21
 <b>Accessories</b> .....	22
 <b>DC/DC Converters Quality Assurance Screening Tables</b>	
Screening Table 1: 883 (Class H, QML), Standard and /ES (non-QML) Product—Element Evaluation ..	23
Screening Table 2: 883 (Class H, QML), Standard and /ES (non-QML) Product— Environmental Screening .....	24
Screening Table 3: Standard and /ES (non-QML) Products—Environmental Screening .....	25
Screening Table 4: HSH (Standard and non-QML) Products—Environmental Screening.....	26

## Crane Co.

Crane Co. is a diversified manufacturer of engineered industrial products. Founded in 1855, Crane provides products and solutions to customers in the aerospace, defense, medical, electronics, hydrocarbon processing, petrochemical, chemical, power generation, automated merchandising, transportation and other markets. The Company has five business segments: Aerospace & Electronics, Fluid Handling, Engineered Materials, Merchandising Systems and Controls. Crane has approximately 11,000 employees in North America, South America, Europe, Asia and Australia. Crane Co. is traded on the New York Stock Exchange (NYSE:CR). For more information, please visit [www.craneco.com](http://www.craneco.com).



### AEROSPACE

Cabin



Fluid Management



Landing Systems

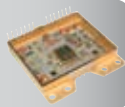


Sensing & Utility Systems



### ELECTRONICS

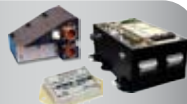
Microelectronics



Microwave Systems



Power

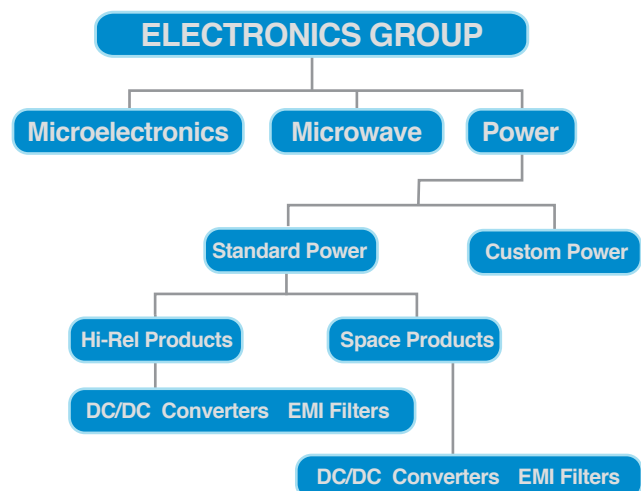


## Crane Aerospace & Electronics

Crane Aerospace & Electronics is a major supplier of systems and components for critical aerospace and defense applications. These systems and components are designed for some of the toughest environments — from engines to landing gear; satellites to medical implants; and missiles to unmanned aerial systems (UAS). Product and service offerings are organized in solution sets, and include Cabin Systems, Fluid Management, Landing Systems, Microelectronics, Microwave, Power, and Sensing & Utility Systems. Products are manufactured under the brand names ELDEC, Hydro-Aire, Interpoint, Keltec, Lear Romec, Merrimac, P.L. Porter and Signal Technology. For more information on Crane Aerospace & Electronics, visit [www.craneae.com](http://www.craneae.com).

## Crane Electronics Group

Crane Electronics of Crane Aerospace & Electronics designs and manufactures high-density, high-reliability electronics for aerospace, space, military, medical and commercial applications. Each Solution is ISO 9001 and AS9100 certified and committed to Operational Excellence and world-class processes. From the Mars Science Lab to commercial aircraft; from implantable devices to missiles and fighter aircraft, our products have proven their ability to operate in the most demanding environments. Our brands include Eldec, Interpoint, Keltec, Merrimac and Signal Technology. For more information on Crane Electronics, please visit [www.craneae.com/electronics](http://www.craneae.com/electronics).



## 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 standard 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.

### High Reliability 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 to DC power converters fully qualified up to MIL-PRF-38534 Class H, QML. To meet demanding time and cost targets, choose a product from the standard converters and filters. Over 1000 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).







### **Custom Power:**

#### **Low Voltage/High Power**

Featuring high efficiency (to 98%) and high power quality, our stackable, high power (typically 2 kW to 66 kW) products are ideal for solid-state radar, regulated power distribution applications, and other avionic, vetronic, and shipboard applications.

#### **Low Voltage/Low Power**

AC/DC and DC/DC low voltage (typically 10 W to 2 kW) power supplies are the ultimate in power conversion reliability for your commercial or military display, avionic or vetronic applications

#### **High Voltage/Low Power**

Our high reliability, high voltage power supplies are designed for both military and commercial aerospace applications, and have output voltages up to 33 kV.

#### **Battery Systems**

Our battery chargers and battery controllers are the optimal high reliability components of a battery system. We offer a complete range of proven solutions for APU start and standby requirements.

#### **Power Management & Distribution Systems**

We integrate standard power components into custom power system solutions that save volume, weight and costs, while increasing reliability.

#### **Transformer Rectifier Units (TRUs)**

Sized from 20 to 400 amps, regulated and unregulated, our TRUs can be customized to meet the specific output voltage and current you need.

#### **Auto-Transformer Rectifier Units (ATRsUs)**

Sized from 1 to 200 kW, our auto-transformer rectifier units are affordable, efficient, light weight and reliable converters that meet today's new stringent power quality requirements.

### Interpoint Products

Our high reliability DC/DC converter and EMI filter modules have proven performance in aerospace, communications, military, space, medical and industrial applications. Over 1000 off-the-shelf high-reliability DC/DC power conversion products are available. Our manufacturing facilities in Redmond and Kaohsiung are ISO 9001:2008/AS9100-B certified. Our offices in France and UK are ISO 9001:2008 certified.

### Redmond Operations

Redmond, Washington, USA

Facility: 81,000 square feet

Founded: 1969

Quality Certifications:

- ISO 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 and Class K, QML

The Redmond site 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.



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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:

- ISO 9001:2008/AS9100-B
- DLA's MIL-PRF-38534 Qualified Manufacturers List (QML)
- Products qualified to Class H, QML

The Kaohsiung site is the high volume manufacturing operation for Interpoint products.



Kaohsiung, Taiwan

## Interpoint Product Overview

### High Temperature Operation

High temperature ceramic capacitors and all-metal thermally-conductive cases provide full power over the operating range of -55 to +125°C (most products).

### 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

For highest reliability, a full range of our products are available as /883 products (Class H, QML). 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 aerospace, military/defense, space, and industrial applications where size, weight and reliability are critical to program success. Our high reliability products are classified as EAR99, no license required for export. Our EAR99 products have been used in commercial satellites.

## Standard Power Conversion

Choose from over 1000 power conversion products. We were one of the first companies to qualify to MIL-STD-1772 (1987) which was DLA's microcircuit standard in 1987. Our first standard microcircuit drawing (SMD) for a Class H hybrid was issued in 1992, and our first Class K hybrid SMD was issued in 1997. In 1997 we were one of the first companies to certify manufacturing to Class K.

## Output Voltage Options

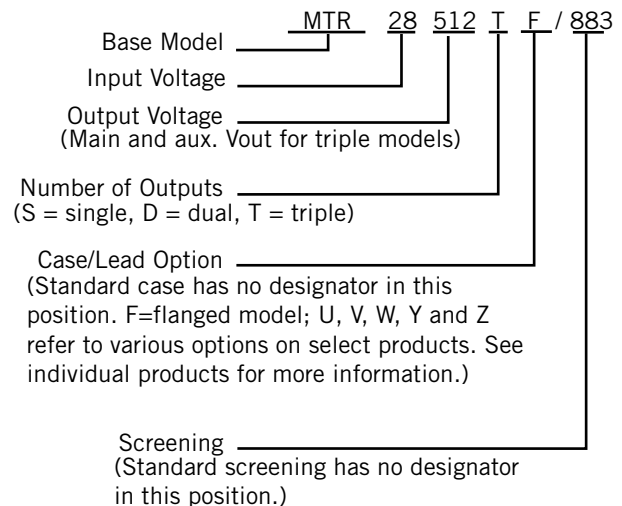
Interpoint converters are capable of providing other output voltage options in addition to those characterized in this catalog. Contact your sales representative to discuss other output voltage options, [www.interpoint.com/contacts](http://www.interpoint.com/contacts).

## Semi-Custom Power Conversion

To fulfill specialized system requirements, we provide custom or semi-custom power solutions. Our experienced design engineers will design a custom power product to match your exact specifications and deliver it on time and on budget.

## Part Numbering

Our part numbering indicates the series (family), input voltage, output voltage, number of outputs, package configuration, and screening code.



## Technical Support

Applications Engineers are available to provide technical support by phone or email. Call +1.425.882.3100, option 7 or 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.



## QUALITY SYSTEM OVERVIEW - Redmond and Kaohsiung

- The quality management system of Crane Electronics, Inc., Standard Power Redmond and Kaohsiung has been certified to ISO9001 and AS9100B, file numbers 1623564, 1623565 and 1623567. The quality management system of Crane Electronics, Inc., Standard Power 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 sites 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 manufacturing sites are audited by a US 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/MilSpec/DocSearch.aspx>.
- 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. Our other products may have pure tin. Refer to our "Lead and Other RoHS Materials" letter for more information at [www.interpoint.com/011](http://www.interpoint.com/011).
- Documented revision controlled procedures/work instructions are in use for all operations that affect quality.
- 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 Interpoint quality system. Procedure matrix QA-093 ([www.interpoint.com/014](http://www.interpoint.com/014)) is the cross reference between qualifying documents (e.g. MIL-PRF-38534, AS9100) and our 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



## 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 Interpoint facility in Redmond 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/AS9100-B—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/AS9100-B.
- 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
- Interpoint 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)



# INTERPOINT HIGH RELIABILITY DC/DC CONVERTERS: SELECTION CHART

MODEL (SERIES)	INPUT VOLTAGE (VDC)	OUTPUT VOLTAGE <sup>1</sup> (VDC)	OUTPUT POWER (W)	EFFICIENCY (% , TYPICAL)	OPERATING TEMPERATURE	SCREENING TABLE	EMI FILTER <sup>2</sup>
<b>NEW! MFP POL Converter</b>	3 - 6	0.64 - 3.5	5.6 - 16.5	73 - 92	-55° to +125°C	MFP Series Env Screening See MFP entry, next page	NA
MOR	16 - 40	3.3, 5, 6.3, 9.5, 12, 15 ±3.3, ±5, ±6.3 ±9.5, ±12, ±15	66 - 120	77 - 87	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-1528
MHP270	160 - 400	5, 12, 15, 28 ±5, ±12, ±15	50 - 65	74 - 82	-55° to +100°C	Table 3 Standard or ES	FME270
MFL	16 - 40	3.3, 5, 12, 15, 28 ±5, ±12, ±15	50 - 65	76 - 86	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0828
FMTR	17 - 40	3.3, 5, 12, 15 ±5, ±12, ±15	20 - 30	75 - 83	-55° to +125°C	Table 3 Standard or ES	Built-in filter
MTR	16 - 40	3.3, 5, 12, 15, 18 ±5, ±12, ±15	20 - 30	76 - 84	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0528
		+5 & ±12, +5 & ±15		75			
MHV	16 - 50	3.3, 5, 12, 15 ±5, ±12, ±15	10 - 15	72 - 83	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0528
		+5 & ±12, +5 & ±15	15	75			
MHF+	16 - 40	1.9, 3.3, 5, 5.2, 5.3, 12, 15, 28 ±5, ±12, ±15	6.65 - 15	62 - 84	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0528
	16 - 48	+5 & ±12 +5 & ±15	15	75			
MSA	16 - 40	5, 5.2, 6.3, 12, 15, 60 <sup>3</sup> ±5, ±12, ±15	1.2 - 5	71 - 80	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0328 or FMSA
MGA	16 - 40	5, 12, 15 ±5, ±12, ±15	5	69 - 74	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0328 or FMGA
HSH	6 - 20	±5	1.5 (12 - 18V) 0.6 (6 - 20V)	7	-20 to +150°C	Table 4 HSH Standard, HSH ES	FMCE-0328 or FMSA (up to 125°C)
MCH	12 - 50	5, 12, 15 ±5, ±12, ±15	1.5	76 - 79	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0328 or FMSA
MGH	12 - 50	5, 12, 15 ±5, ±12, ±15	1.5	76 - 79	-55° to +125°C	Table 1 and 2 Standard, ES, or 883, Class H-QML	FMCE-0328 or FMGA

Note:

1. Our high-reliability DC/DC converters are capable of providing other output voltages in addition to those characterized in this catalog. Contact your sales representative to discuss other output options.
2. The filters listed are suggested filters. Any of our high reliability filters can be used with our converters up to the filter's rated maximum current.
3. MSA2860S is available with Standard and /ES screening options only.

## MFP SERIES™ POINT OF LOAD CONVERTER

### No external components required

- Operating temperature -70° to +150°C
- Up to 92% efficiency, flat down to 30% load
- Qualified up to MIL-PRF-38534 Class H
- Input voltage range 3.0 to 6.0 VDC
- Input transient for up to 15 V<sub>IN</sub> for up to 1 sec.
- Inhibit and sync functions
- Current monitoring
- Current sharing pin for parallel operation
- Five pin-selectable, preset voltages:
  - 0.64, 0.8, 1.6, 2.5 and 3.3
- Output voltage continuously adjustable from 0.8 to 3.5 V with resistors
- Indefinite output short circuit protection
- Adjustable start-up sequencing
- Remote sense and voltage margining

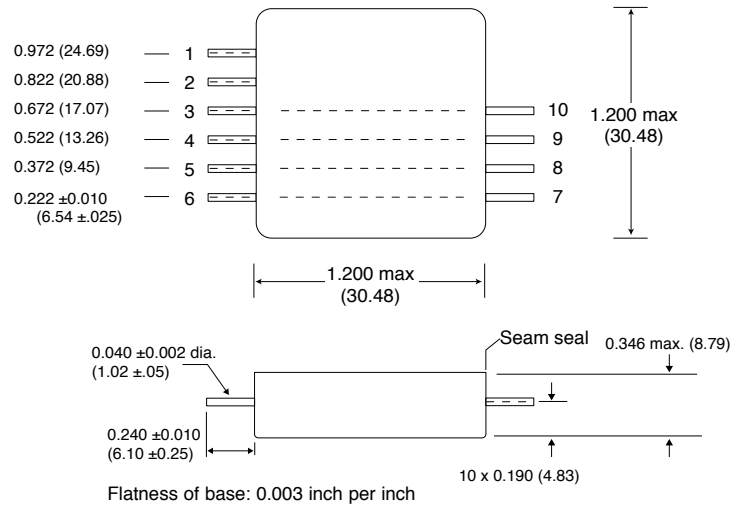
The MFP Series™ of DC/DC converters do not require any external components to achieve all specified performance levels. They are a high-reliability, high-efficiency point of load converter for use with a 3.3 VDC input bus or a 5 VDC input bus. The MFP0507S model has the flexibility to be set for any output voltage from 0.64 VDC to 3.5 VDC. 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 V 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. For the most current specifications refer to the MFP datasheet at [www.interpoint.com/mfp](http://www.interpoint.com/mfp).

MODEL	INPUT (VDC) <sup>1, 2</sup>	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.) <sup>3</sup>
MFP0507S	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.

TOP VIEW CASE D3  
MFP Series Single



MFP SERIES ENVIRONMENTAL SCREENING TABLE	NON-QML <sup>1</sup>	QML <sup>2</sup> CLASS H
TEST PERFORMED	/ST	/883
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 (Qual 5000 g)		■
PIND, Test Method 2020, Cond. A		■ <sup>3</sup>
Pre burn-in test, Group A, Subgroups 1 and 4		■
Burn-in Method 1015, +125°C case, typical <sup>4</sup> 160 hours		■
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		
Gross Leak, Dip (1 x 10 <sup>-3</sup> )	■	
Gross Leak, Method 1014, Cond. C		■
Fine Leak, Method 1014, Cond. A		■
Final visual inspection, Method 2009	■	■
Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.		

#### Environmental Screening Table Notes:

1. /ST (standard) is a non-QML products and may not meet all of the requirements of MIL-PRF-38534.
2. All processes are QML qualified and performed by certified operators.
3. Not required by DLA but performed to assure product quality.
4. Burn-in temperature designed to bring the case temperature to +125°C minimum.

## INTERPOINT HIGH RELIABILITY DC/DC CONVERTERS

### MOR SERIES™ CONVERTER—120 WATT OUR MOST VERSATILE CONVERTER

**Parallel operation with current share,  
up to 5 units (540 watts)**

**Output flexibility, trim of 60% to 110%**

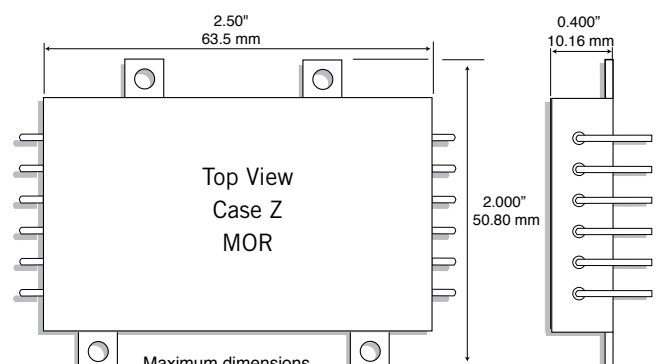
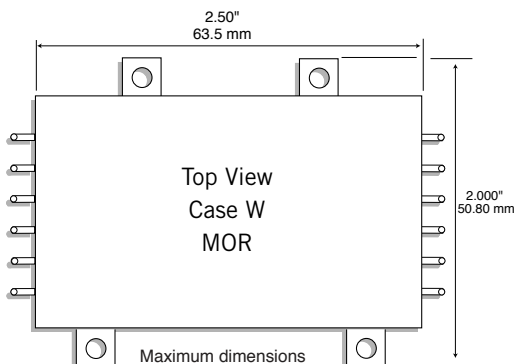
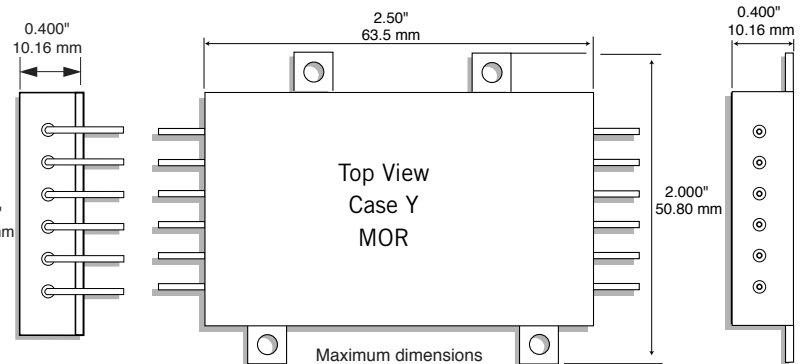
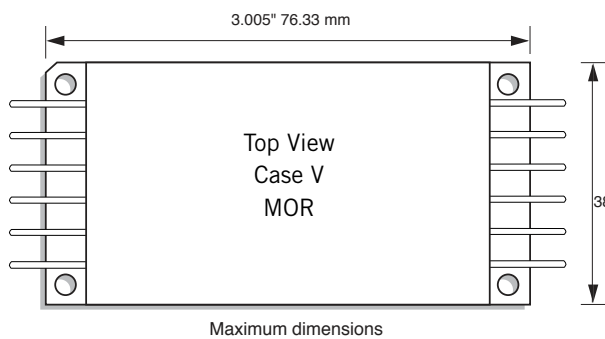
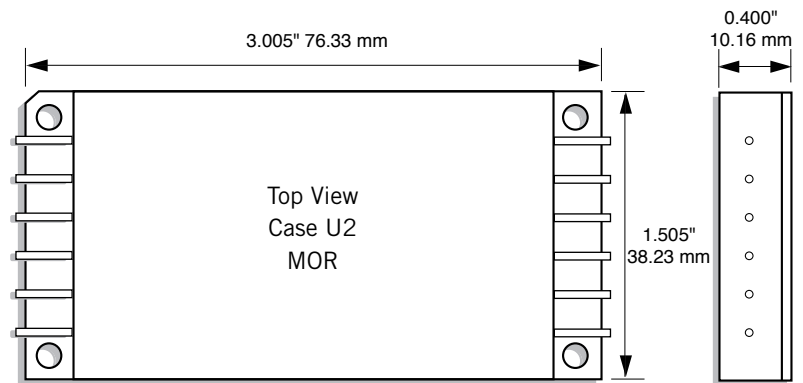
- Operating temperature -55° to +125°C
- Input voltage 16 to 40 VDC
- Transient protection 50 V for 120 ms
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Remote sense
- Inhibit function
- Sync In and Sync Out
- Indefinite short circuit protection
- High power density with up to 87% efficiency

With up to 120 watts of output power, the MOR Series™ of DC/DC converters operates from a standard 28 volt bus and offers a wide input range of 16 to 40 VDC. Full operation over the temperature range, -55° to +125°C, makes the MOR Series an ideal choice for aerospace, military, space and other high reliability applications. In compliance with MIL-STD-704D, the converters will withstand transients of up to 50 volts for up to 120 milliseconds. Use our FME28-461 EMI filter to pass MIL-STD-461C, CE03 requirements. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MOR datasheet at [www.interpoint.com/MOR](http://www.interpoint.com/MOR).

Also available in package configurations  
V, W, Y and Z (not to scale):

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MOR283R3S	16 to 40	3.3	20.00	66	78
MOR2805S	16 to 40	5	20.00	100	81
MOR286R3S	16 to 40	6.3	16.00	100	83
MOR289R5S	16 to 40	9.5	11.00	105	84
MOR2812S	16 to 40	12	9.20	110	86
MOR2815S	16 to 40	15	8.00	120	87
MOR283R3D	16 to 40	±3.3	20.00 <sup>1</sup>	66 <sup>1</sup>	77
MOR2805D	16 to 40	±5	20.00 <sup>1</sup>	100 <sup>1</sup>	81
MOR286R3D	16 to 40	±6.3	16.00 <sup>1</sup>	100 <sup>1</sup>	83
MOR289R5D	16 to 40	±9.5	11.05 <sup>1</sup>	105 <sup>1</sup>	84
MOR2812D	16 to 40	±12	9.16 <sup>1</sup>	110 <sup>1</sup>	86
MOR2815D	16 to 40	±15	8.00 <sup>1</sup>	120 <sup>1</sup>	87

1. Up to 70% of the total current/power is available from either output providing the opposite output is carrying at least 15% of the power in use. The spec shown is the maximum total current/power.



## MHP270 SERIES™ CONVERTERS—65 WATT

### Parallel operation with current share, up to 5 units (276 watts)

- Operating range -55° to +100°C
- Transient protection 450 V for 50 ms
- Fully isolated, magnetic feedback

The high power density MHP Series uses current mode voltage control to allow parallel current sharing for increased power and true n + 1 redundancy without external components. See Screening Table 3. For the most current specifications refer to the MHP270 datasheet at [www.interpoint.com/MHP](http://www.interpoint.com/MHP).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MHP27005S	160 to 400	5	10.00	50	76
MHP27012S	160 to 400	12	5.00	60	81
MHP27015S	160 to 400	15	4.33	65	80
MHP27028S	160 to 400	28	2.32	65	80
MHP27005D	160 to 400	±5	10.00 <sup>1</sup>	50 <sup>1</sup>	74
MHP27012D	160 to 400	±12	5.00 <sup>1</sup>	60 <sup>1</sup>	81
MHP27015D	160 to 400	±15	4.33 <sup>1</sup>	65 <sup>1</sup>	82

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 spec shown is the maximum total current/power.

## MFL SERIES™ CONVERTERS—65 WATT

### Parallel operation with current share, up to 3 units (185 watts)

- -55° to +125°C operation
- 50 V for 120 ms transient protection
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Remote sense or output trim on single output models

The MFL Series converters offer up to 65 watts output power in a sealed metal case. Standard features include undervoltage lockout, remote sense, and sync. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MFL datasheet at [www.interpoint.com/MFL](http://www.interpoint.com/MFL).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MFL283R3S	16 to 40	3.3	12.12	40	76
MFL2805S	16 to 40	5	10.00	50	80
MFL2812S	16 to 40	12	5.00	60	86
MFL2815S	16 to 40	15	4.33	65	87
MFL2828S	16 to 40	28	2.32	65	86
MFL2805D	16 to 40	±5	10.00 <sup>1</sup>	50 <sup>1</sup>	80
MFL2812D	16 to 40	±12	5.00 <sup>1</sup>	60 <sup>1</sup>	86
MFL2815D	16 to 40	±15	4.33 <sup>1</sup>	65 <sup>1</sup>	87

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 spec shown is the maximum total current/power.

## FMTR SERIES™ CONVERTERS—30 WATT

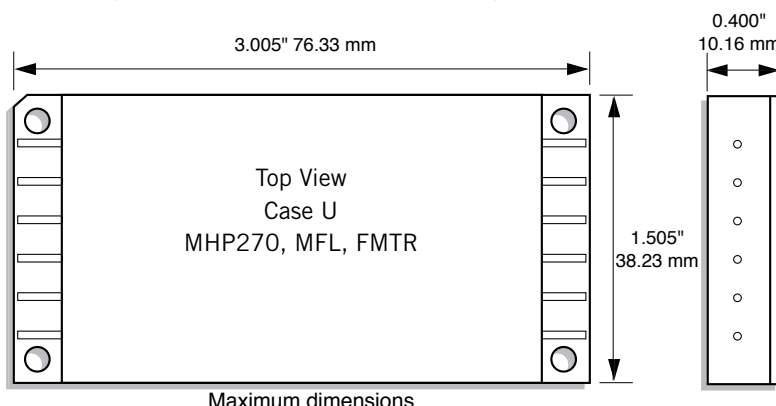
### EMI input filter, up to 50 dB attenuation High frequency output filter

- -55° to +125°C operation
- 17 to 40 VDC input
- Up to 50 V for 50 ms transient protection
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Trim and remote sense on singles
- Inhibit and synchronization functions
- Indefinite short circuit protection
- High power density, up to 83% efficiency

The FMTR Series™ of DC/DC converters has a 2.7 amp EMI input filter that meets MIL-STD-461C, CE03 and allows filtering of additional converters through the filter output pins up to the current limit of the filter. FMTR converters are packaged in hermetically sealed metal cases, making them ideal for use in aerospace, military and other high reliability applications. Available with Standard or ES Quality Assurance screening. See Screening Table 3. For the most current specifications refer to the FMTR datasheet at [www.interpoint.com/M02](http://www.interpoint.com/M02).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
FMTR283R3S	17 to 40	3.3	6.06	20	75
FMTR2805S	17 to 40	5	5.00	25	77
FMTR2812S	17 to 40	12	2.50	30	82
FMTR2815S	17 to 40	15	2.00	30	83
FMTR2805D	17 to 40	±5	5.00 <sup>1</sup>	25 <sup>1</sup>	77
FMTR2812D	17 to 40	±12	2.50 <sup>1</sup>	30 <sup>1</sup>	80
FMTR2815D	17 to 40	±15	2.00 <sup>1</sup>	30 <sup>1</sup>	82

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





MTR SERIES™ CONVERTERS—30 WATT  
SINGLE, DUAL OR TRIPLE

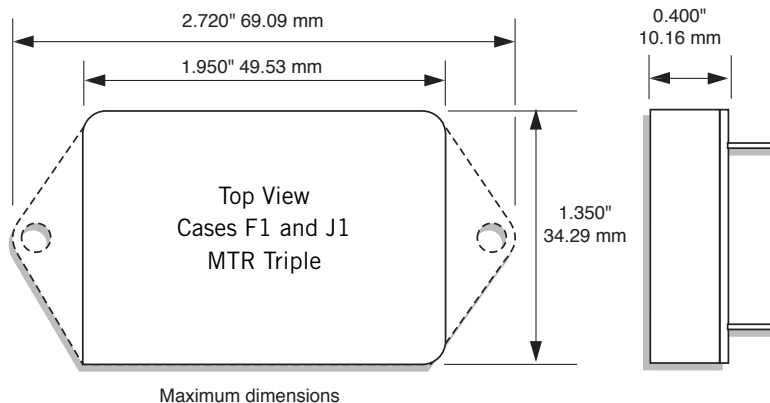
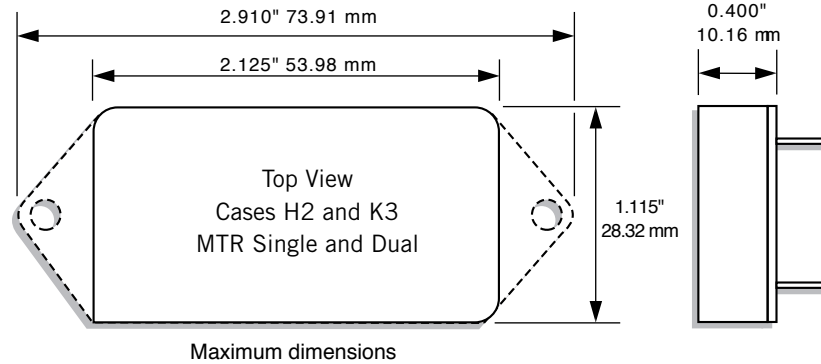
**No cross-regulation error on triple output models**

- Operating temperature -55° to +125°C
- Transient protection 50 V for 50 ms
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Indefinite short circuit and overload protection

The high frequency MTR Series converters are in a hermetically sealed package. Also available in a flanged. Features for the isolated, regulated units include inhibit, remote sense, voltage trim and synchronization. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MTR datasheet at [www.interpoint.com/MTR](http://www.interpoint.com/MTR).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MTR283R3S	16 to 40	3.3	6.06	20	76
MTR2805S	16 to 40	5	5.00	25	78
MTR2812S	16 to 40	12	2.50	30	83
MTR2815S	16 to 40	15	2.00	30	84
MTR2818S	16 to 40	18	1.67	30	84
MTR2805D	16 to 40	±5	5.00 <sup>1</sup>	25 <sup>1</sup>	78
MTR2812D	16 to 40	±12	2.50 <sup>1</sup>	30 <sup>1</sup>	81
MTR2815D	16 to 40	±15	2.00 <sup>1</sup>	30 <sup>1</sup>	83
MTR28512T	16 to 40	Main +5 & Aux. ±12	4.00 0.830 <sup>2</sup>	30 <sup>2</sup>	75
MTR28515T	16 to 40	Main +5 & Aux. ±15	4.00 0.660 <sup>2</sup>	30 <sup>2</sup>	75

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 spec shown is the maximum total current/power.
2. Up to 90% of the total auxiliary current/power is available from either auxiliary output, providing the opposite output is carrying at least 10% of the total auxiliary power in use. The spec shown is the maximum total current/power. Total from auxiliaries not to exceed 10 W.



## MHV SERIES™ CONVERTERS—15 WATT

### No cross-regulation error on dual outputs

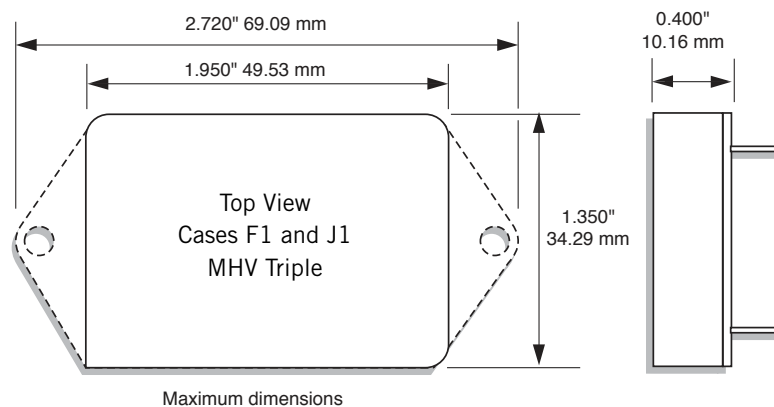
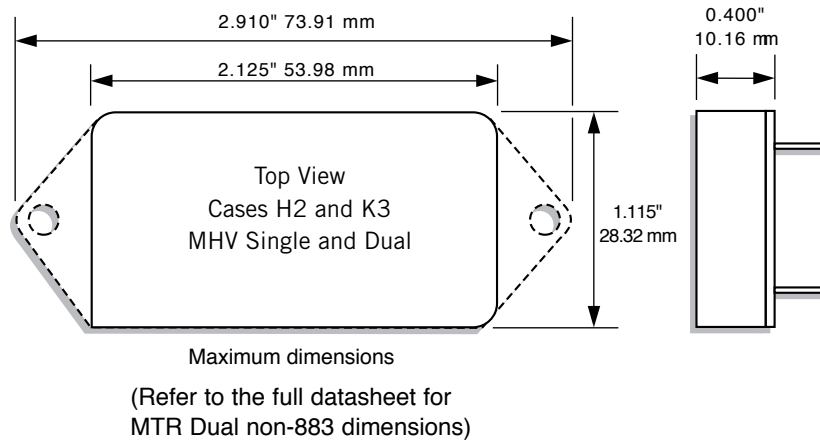
- Operating temperature -55° to +125°C
- Input voltage range 16 to 50 VDC
- Transient protection up to 80 V for 120 ms
- Fixed frequency switching
- Output trim on single output models
- Inhibit and sync functions

The wide input voltage range is further supplemented by an ability to withstand an 80 volt transient for 120 milliseconds. Typical output ripple is as low as 15 mV at 20 MHz. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MHV datasheet at [www.interpoint.com/MHV](http://www.interpoint.com/MHV).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MHV283R3S	16 to 50	3.3	3.03	10	72
MHV2805S	16 to 50	5	3.00	15	77
MHV2812S	16 to 50	12	1.25	15	81
MHV2815S	16 to 50	15	1.00	15	81
MHV2805D	16 to 50	±5	3.00 <sup>1</sup>	15 <sup>1</sup>	79
MHV2812D	16 to 50	±12	1.25 <sup>1</sup>	15 <sup>1</sup>	83
MHV2815D	16 to 50	±15	1.00 <sup>1</sup>	15 <sup>1</sup>	83
MHV28512T	16 to 50	Main +5 & Aux. ±12	2.00 0.416 <sup>2</sup>	15 <sup>2</sup>	78
MHV28515T	16 to 50	Main +5 & Aux. ±15	2.00 0.333 <sup>2</sup>	15 <sup>2</sup>	78

1. Up to 7.5 watts is available from either dual output. The spec shown is the maximum total current/power.

2. Up to 80% of the total auxiliary current/power is available from either auxiliary output, providing the opposite auxiliary output is carrying at least 20% of the auxiliary power in use. Total auxiliary power not to exceed 5W. The spec shown is the maximum total current/power.



## MHF+ SERIES™ CONVERTERS—15 WATT SINGLE, DUAL OR TRIPLE

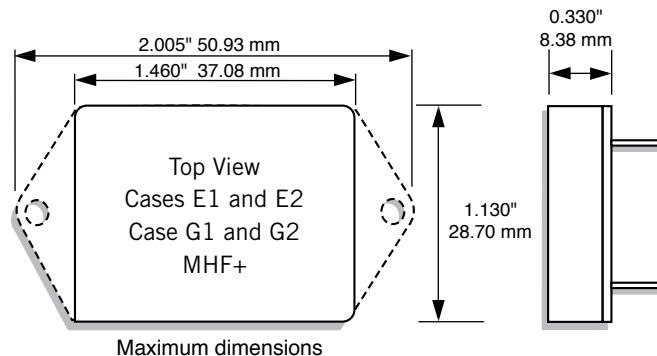
### Hermetically sealed case 0.33 inches (8.38 mm) high

- Operating temperature –55° to +125°C
- Input voltage 16 to 40 VDC (16 to 48 VDC triple)
- Transient protection
  - » Single and dual: 50 V for 50 ms
  - » Triple: 80 V for 120 ms
- Fully isolated
- Fixed high frequency switching
- Inhibit and synchronization functions
- Indefinite short circuit protection
- Up to 84% efficiency

MHF+ Series of converters provide up to 15 watts output power over the full –55 to +125°C temperature range. The converters are packaged in hermetically sealed metal cases using only 1.7 square inches of board area and are 0.330" high. Up to 84% efficiency. Single, dual and triple outputs available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MHF+ datasheet at [www.interpoint.com/MHF](http://www.interpoint.com/MHF).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MHF+281R9S	16 to 40	1.9	3.50	6.65	62
MHF+283R3S	16 to 40	3.3	2.40	8	75
MHF+2805S	16 to 40	5	2.40	12	77
MHF+285R2S	16 to 40	5.2	2.40	12.48	77
MHF+285R3S	16 to 40	5.35	2.83	15	77
MHF+2812S	16 to 40	12	1.25	15	79
MHF+2815S	16 to 40	15	1.00	15	80
MHF+2828S	16 to 40	28	0.540	15	84
MHF+2805D	16 to 40	±5	2.40 <sup>1</sup>	12 <sup>1</sup>	79
MHF+2812D	16 to 40	±12	1.25 <sup>1</sup>	15 <sup>1</sup>	83
MHF+2815D	16 to 40	±15	1.00 <sup>1</sup>	15 <sup>1</sup>	84
MHF+28512T <sup>2</sup>	16 to 48	+5 & ±12	1.50 0.625 <sup>2</sup>	15 <sup>2</sup>	76
MHF+28515T <sup>2</sup>	16 to 48	+5 & ±15	1.50 0.500 <sup>2</sup>	15 <sup>2</sup>	76

1. Up to 90% of the total current/power (80% for the MHF+2805D) is available from either dual output, providing the opposite output is carrying at least 10% of the power in use (20% for the MHF+2805D). The spec shown is the maximum total current/power.
2. Up to 90% of the total auxiliary current/power is available from either auxiliary output, providing the opposite output is carrying at least 10% of the total auxiliary power in use. The spec shown is the maximum total current/power. Total from auxiliaries not to exceed 7.5 W.



## MSA SERIES™ CONVERTERS—5 WATT

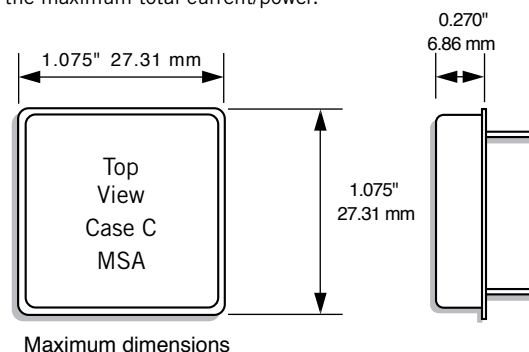
### Small size of 1.16 in<sup>2</sup> (7.5 cm<sup>2</sup>)

- Operating temperature -55° to +125°C
- Input voltage range 16 to 40 VDC
- Transient protection 50 V for 50 ms
- Fully isolated
- Fixed high frequency switching
- Inhibit function
- Indefinite short circuit protection
- Up to 74% efficiency

The MSA Series converters offer up to 5 watts output power in our low profile case—just 0.270 inches high. These regulated, isolated converters offer 500 kHz switching and full power operation over the full temperature range of -55° to +125°C. Audio rejection is up to 50 dB. No external capacitors are required. Metal hermetically sealed cases. Single and dual outputs. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MSA datasheet at [www.interpoint.com/MSA](http://www.interpoint.com/MSA).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MSA2805S	16 to 40	5	1.00	5	71
MSA285R2S	16 to 40	5.2	0.962	5	71
MSA286R3S	16 to 40	6.3	0.800	5	80
MSA2812S	16 to 40	12	0.417	5	76
MSA2815S	16 to 40	15	0.333	5	76
MSA2860S	16 to 40	60	0.020	1.2	75
MSA2805D	16 to 40	±5	1.00 <sup>1</sup>	5 <sup>1</sup>	72
MSA2812D	16 to 40	±12	0.417 <sup>1</sup>	5 <sup>1</sup>	75
MSA2815D	16 to 40	±15	0.333 <sup>1</sup>	5 <sup>1</sup>	75

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



## MGA SERIES™ CONVERTERS—5 WATT

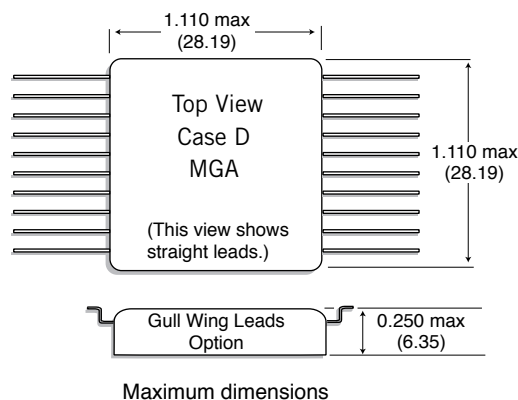
### Surface mount package, 1.23 in<sup>2</sup> (7.9 cm<sup>2</sup>)

- Operating temperature -55° to +125°C
- Input voltage range 16 to 40 VDC
- Transient protection 50 V for 50 ms
- Fully isolated
- Fixed high frequency switching
- Inhibit function
- Indefinite short circuit protection
- Up to 74% efficiency

The MGA Series converters offer up to 5 watts output power in our lowest profile case—just 0.250 inches high. These regulated, isolated converters offer 500 kHz switching and full power operation over the full temperature range of -55° to +125°C. Audio rejection is up to 50 dB. No external capacitors are required. Metal sealed cases. Single and dual outputs. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MGA datasheet at [www.interpoint.com/MGA](http://www.interpoint.com/MGA).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MGA2805S	16 to 40	5	1.00	5	69
MGA2812S	16 to 40	12	0.417	5	74
MGA2815S	16 to 40	15	0.333	5	74
MGA2805D	16 to 40	±5	1.00 <sup>1</sup>	5 <sup>1</sup>	72
MGA2812D	16 to 40	±12	0.417 <sup>1</sup>	5 <sup>1</sup>	73
MGA2815D	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 output providing the opposite output is carrying at least 20% of the power in use. The spec shown is the maximum total current/power.



## HSH SERIES™ CONVERTERS—1.5 WATT

**Operating temperature -55°C to +150°C**

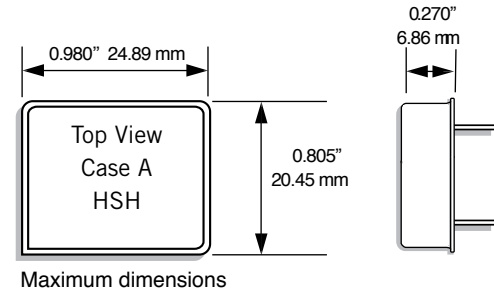
**Input voltage range 6 to 20 VDC**

- Transient protection 40 V for up to 120 ms
- Fully isolated
- Magnetic feedback
- Variable operating frequency
- Inhibit function

With a miniature footprint of just 0.8 square inches, the HSH Series™ of DC/DC converters delivers 1.5 watts of output power while saving significant board real estate. The wide input voltage range of 6 to 20 VDC accepts the varying voltages of industrial, military or battery 15 VDC bus power and tightly regulates output voltages to protect downstream components. Transient protection of 40 volts for up to 120 milliseconds. May be used with the FMSA EMI filter up to 125°C. Available with Standard or / ES Quality Assurance screening. See Screening Table 4. Contact factory for details. For the most current specifications refer to the HSH datasheet at [www.interpoint.com/HSH](http://www.interpoint.com/HSH).

HSH2805D					
TEMPERATURE	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A) <sup>1</sup>	POWER MAX. (W) <sup>1</sup>	EFF (% typ.)
25°C	12 to 18 6 to 20	±5	±0.240 ±0.096	1.5 0.6	74
-20 to +125°C	12 to 18 6 to 20	±5	±0.240 ±0.096	1.5 0.6	67
+150°C	12 to 18 6 to 20	±5	±0.160 ±0.096	1.0 0.6	59

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





## MCH SERIES™ CONVERTERS—1.5 WATT

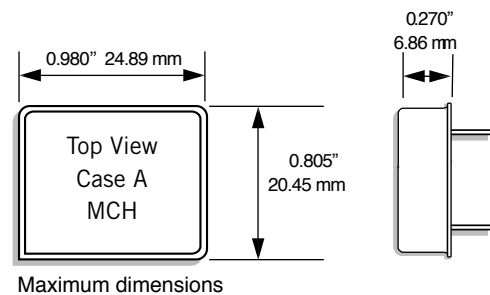
### Small footprint of 0.79 in<sup>2</sup> (5.1 cm<sup>2</sup>)

- Operating temperature -55°C to +125°C
- Input voltage range 12 to 50 VDC
- Transient protection 80 V for up to 120 ms
- Up to 70 V for the 15 V single and dual models
- Fully isolated, magnetic feedback
- Fixed frequency switching
- Inhibit function
- Indefinite short circuit protection
- Undervoltage lockout
- Up to 79% efficiency

The MCH offers 1.5 watts in 0.8 square inches. The parts offer full power operation from 12 to 50 VDC input over the full -55° to +125°C temperature range. Single and dual outputs. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MCH datasheet at [www.interpoint.com/MCH](http://www.interpoint.com/MCH).

MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MCH2805S	12 to 50	5	0.300	1.5	77
MCH2812S	12 to 50	12	0.125	1.5	79
MCH2815S	12 to 50	15	0.100	1.5	79
MCH2805D	12 to 50	±5	±0.300 <sup>1</sup>	1.5 <sup>1</sup>	77
MCH2812D	12 to 50	±12	±0.125 <sup>1</sup>	1.5 <sup>1</sup>	77
MCH2815D	12 to 50	±15	±0.100 <sup>1</sup>	1.5 <sup>1</sup>	76

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



## MGH SERIES™ CONVERTERS—1.5 WATT

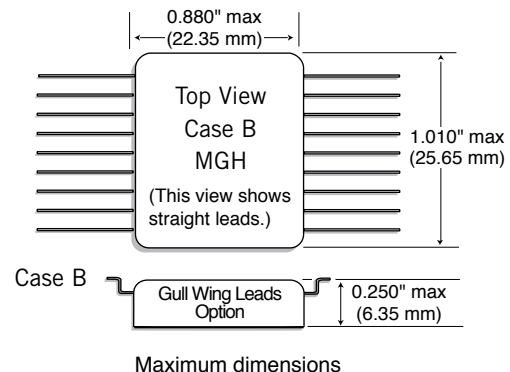
### Surface mount package, 0.89 in<sup>2</sup> (5.7 cm<sup>2</sup>)

- Operation temperature -55°C to +125°C
- Input voltage range 12 to 50 VDC
- Transient protection 80 V for up to 120 ms
  - » Up to 70 V for the 15 V single and dual models
- Fully isolated, magnetic feedback
- Fixed frequency switching
- Inhibit function
- Indefinite short circuit protection
- Undervoltage lockout
- Up to 79% efficiency

The MGH offers 1.5 watts of full power operation from 12 to 50 VDC input over the full -55° to +125°C temperature range. Single and dual outputs. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MGH datasheet at [www.interpoint.com/MGH](http://www.interpoint.com/MGH).

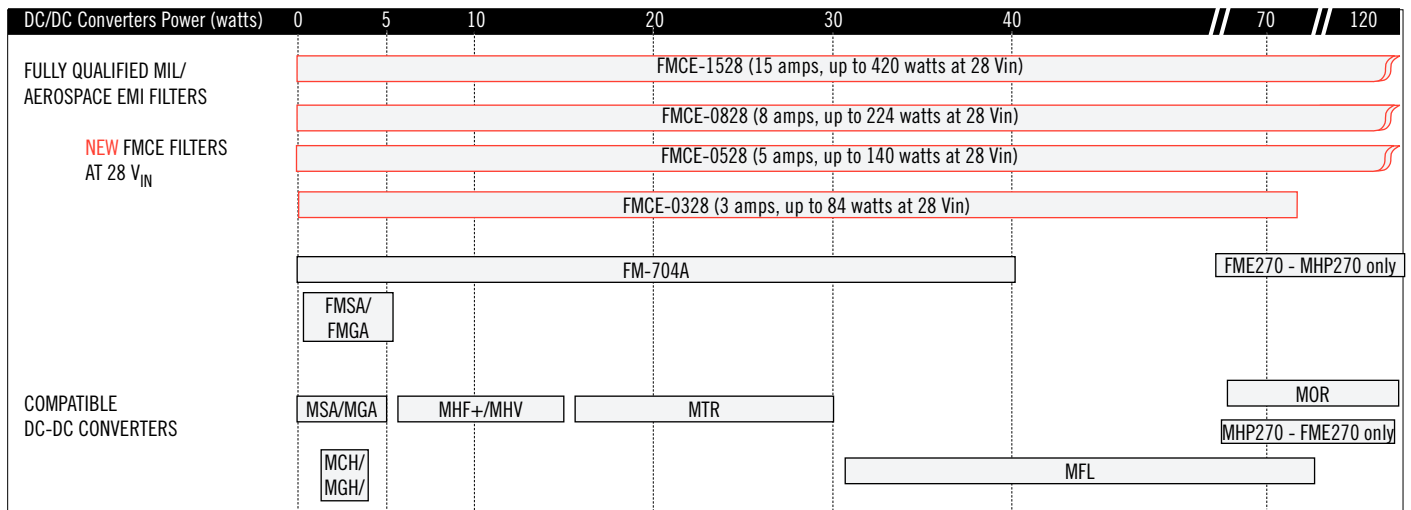
MODEL	INPUT (VDC)	OUTPUT AT FULL LOAD			
		OUTPUT (VDC)	CURRENT (A)	POWER MAX. (W)	EFF (% typ.)
MGH2805S	12 to 50	5	0.300	1.5	77
MGH2812S	12 to 50	12	0.125	1.5	79
MGH2815S	12 to 50	15	0.100	1.5	79
MGH2805D	12 to 50	±5	±0.300 <sup>1</sup>	1.5 <sup>1</sup>	77
MGH2812D	12 to 50	±12	±0.125 <sup>1</sup>	1.5 <sup>1</sup>	77
MGH2815D	12 to 50	±15	±0.100 <sup>1</sup>	1.5 <sup>1</sup>	76

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



## INTERPOINT HIGH RELIABILITY EMI FILTERS: SELECTION CHART

### EMI FILTER GUIDE



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

MODEL	NEW FMCE DROP-IN REPLACEMENT FOR	INPUT VOLTAGE (VDC)	CURRENT (MAX. A)	MINIMUM ATTENUATION (DB) @ 500 kHz	SCREENING TABLE	COMPATIBLE CONVERTER
NEW FMCE-1528	FME28-461	-0.5 to 50	15	60	Table 1 and 2 Standard, ES, or 883, Class H-QML	MOR, MFL, MTR, MHV, MHF+, MSA, MGA, MCH, MGH
NEW FMCE-0828	FMD28-461	-.05 to 50	8	50	Table 1 and 2 Standard, ES, or 883, Class H-QML	MOR, MFL, MTR, MHV, MHF+, MSA, MGA, MCH, MGH,
NEW FMCE-0528	FMC-461	-.05 to 50	5	55	Table 1 and 2 Standard, ES, or 883, Class H-QML	MOR, MFL, MTR, MHV, MHF+, MSA, MGA, MCH, MGH
NEW FMCE-0328	FMH-461	-.05 to 50	3	50	Table 1 and 2 Standard, ES, or 883, Class H-QML	MHV, MHF+, MSA, MGA, MCH, MGH
FM-704A		16 to 40	2.5 @ 16 Vin 1.0 @ 40 Vin	60	Table 1 and 2 Standard, ES, or 883, Class H-QML	MOR, MFL, MTR, MHV, MHF+, MSA, MGA, MCH, MGH
FME270-461		0 to 400	1.5	40	Table 1 and 2 Standard, ES, or 883, Class H-QML	MHP270
FMSA-461		0 to 50	0.80	55	Table 1 and 2 Standard, ES, or 883, Class H-QML	MSA and MCH Series
FMGA-461		0 to 50	0.80	55	Table 1 and 2 Standard, ES, or 883, Class H-QML	MGA and MGH Series

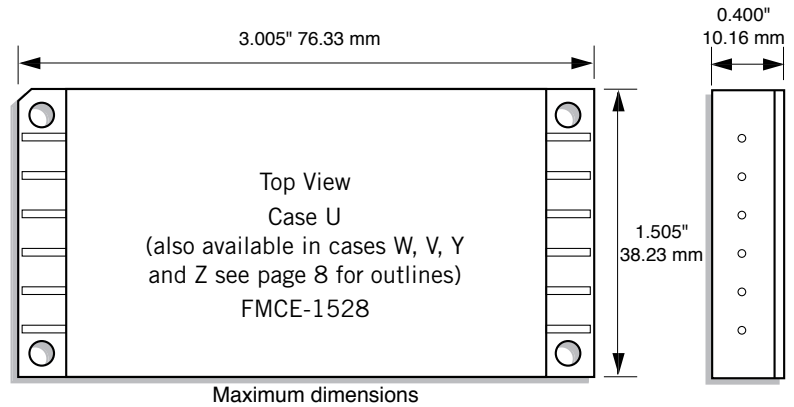
## NEW! FMCE-1528 EMI FILTER—15 AMP

### Attenuation to 70 dB at 500 kHz, typical Filter multiple converters up to the rated current

- Operating temperature -55° to +125°C
- Nominal 28 V input, -0.5 to 50 V operation
- Transient rating -0.5 to 80 V for 1 second
- Up to 15 A throughput current over the full input voltage range of -0.5 to 50 V
- Compliant to
  - MIL-STD-461C,CE03
  - MIL-STD-461D, E and F CE102
  - MIL-STD-461C CS01
  - MIL-STD-461D, E and F CS101

The FMCE-1528 is a drop-in replacement for the FME28-461. One filter can be used with multiple converters up to the rated output current of the filter. Operating temperature is -55 to +125°C. FMCE-1528 filters are available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FMCE-1528 datasheet at [www.interpoint.com/F09](http://www.interpoint.com/F09).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FMCE-1528	-0.5 to 50	15 (Over the full temperature range and input voltage range.)	60 dB @ 500 kHz	MOR, MFL, MTR, MHV, MHF+, MSA, MGA, HSH, MCH, MGH



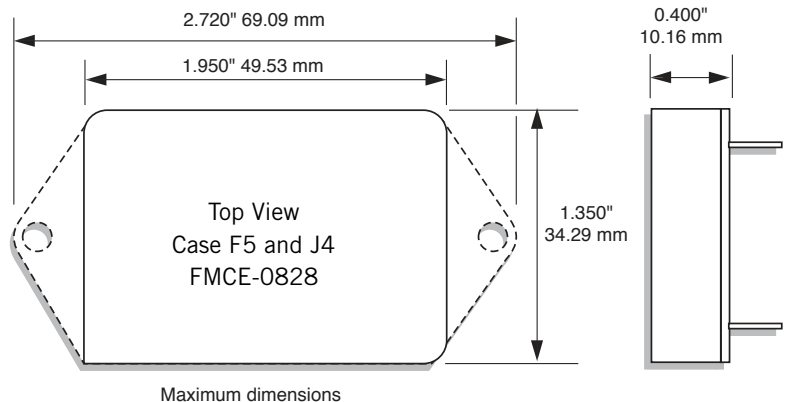
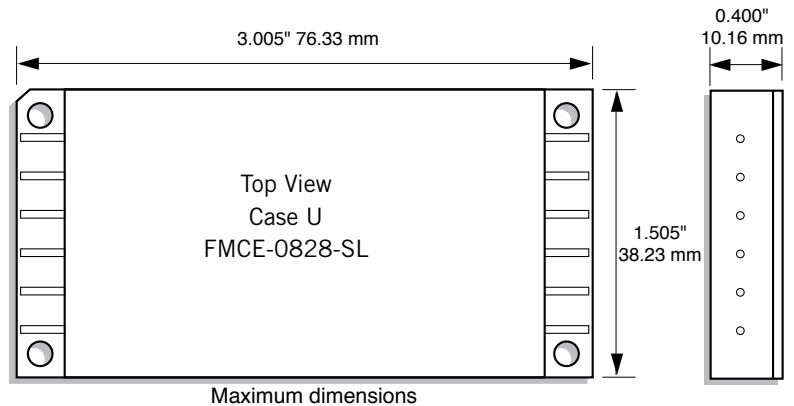
## NEW! FMCE-0828 EMI FILTERS—8 AMP

### Attenuation 60 dB at 500 kHz, typical

- Operating temperature -55° to +125°C
- Nominal 28 V input, -0.5 to 50 V operation
- Transient rating -0.5 to 80 V for 1 second
- Up to 8 A throughput current over the full input voltage range of -0.5 to 50 V
- Compliant to
  - MIL-STD-461C CE03
  - MIL-STD-461D, E and F CE102
  - MIL-STD-461C CS01
  - MIL-STD-461D, E and F CS101

FMCE-0828 is a drop in replacement for the FMD28-461 EMI filter and has a higher current rating. FMCE-0828 filters minimize electromagnetic interference (EMI) for the MFL, MOR, MTR, MHV and MHF+ Series of converters. One filter can be used with multiple converters up to the rated output current of the filter. FMCE-0828 filters are available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FMCE-0828 datasheet at [www.interpoint.com/F10](http://www.interpoint.com/F10).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FMCE-0828	-0.5 to 50	8.00	50 dB @ 500 kHz	MOR, MFL, MTR, MHV, MHF+, MSA, MGA, HSH, MCH, MGH



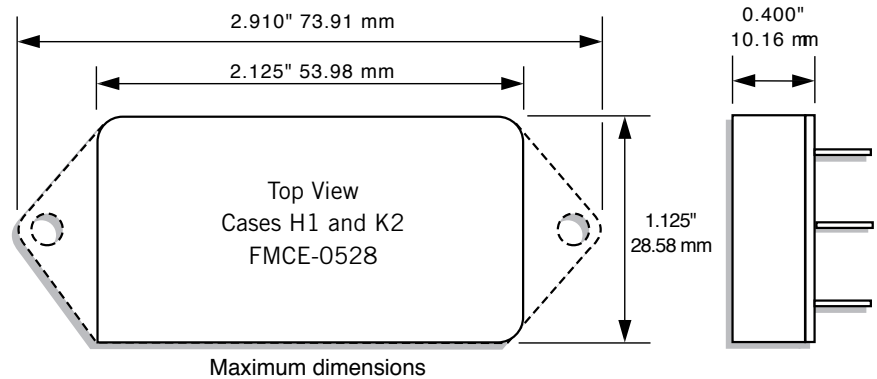
### FMCE-0528 EMI FILTER—5 AMPS

#### Attenuation to 60 dB at 500 kHz, typical

- Operating temperature -55° to +125°C
- Nominal 28 V input, -0.5 to 50 V operation with or without transorb
- Transient rating -0.5 to 80 V for 1 second
- Up to 5 A throughput current over the full input voltage range -0.5 to 50 V
- Compliant to
  - MIL-STD-461C CE03
  - MIL-STD-461D, E and F CE102
  - MIL-STD-461C CS01
  - MIL-STD-461D, E, and F CS101

The FMCE-0528™ EMI filter is a drop-in replacement for the FMC-461 and has a higher current rating. The filter can be used with combinations of the lower power converters; up to two MTR series converters or a single MFL series converter. The FME-0528-TR filter has a fast-reacting (1 pico second) transient suppressor which begins clamping the input voltage at approximately 47 VDC to protect the DC/DC converter from damage. The FMCE-0528 does not have a transorb. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FMCE-0528 datasheet at [www.interpoint.com/F11](http://www.interpoint.com/F11).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FMCE-0528	-0.5 to 50	5	55 dB @ 500 kHz	MTR, MHV, MHF+, MSA, MGA, HSH, MCH, MGH



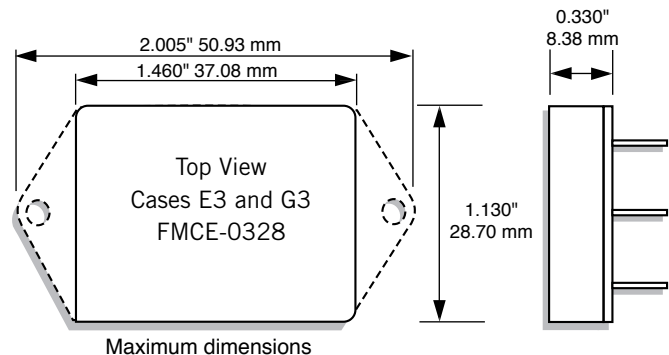
### FMCE-0328 EMI FILTER—3 AMPS

#### Attenuation to 60 dB at 500 kHz, typical

- Operating temperature -55° to +125°C
- Nominal 28 V input, -0.5 to 50 V operation
- Transient rating -0.5 to 80 V for 1 second
- Up to 3 A throughput current over the full input voltage range of -0.5 to 50 V
- Compliant to
  - MIL-STD-461C CE03
  - MIL-STD-461D, E and F CE102
  - MIL-STD-461C CS01
  - MIL-STD-461D, E and F CS101

The FMCE-0328™ EMI filter is a drop-in replacement for the FMH-461 and has a higher current rating. At 50 VDC input (high line), the filter provides 150 watts of throughput power. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FMCE-0328 datasheet at [www.interpoint.com/F12](http://www.interpoint.com/F12).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FMCE-0328	-0.5 to 50	3	50 dB @ 500 kHz	MHV, MHF+, MSA, MGA, HSH, MCH, MGH



## FM-704A EMI FILTER—40 WATT

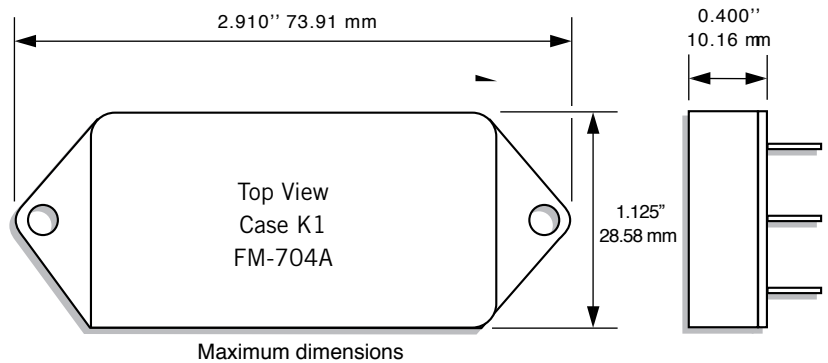
### Active transient suppression

#### Undervoltage lockout

- Operating temperature -55° to +125°C
- Nominal 28 V input, 16 V to 40 V operation
- Inhibit function
- Compliant to MIL-STD-461C CE-03
- Compatible with MIL-STD-704 A-E 28 VDC power bus

The FM-704A protection module protects Interpoint high frequency converters against MIL-STD-1275A and MIL-STD-704A surges and MIL-STD-461 CS06 spikes. Its filter element brings MHF+, MSA, MCH and MHV converters within MIL-STD-461's CE03 noise limits. Up to 40 watts throughput from -55 to +125°C. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FM-704A datasheet at [www.interpoint.com/F03](http://www.interpoint.com/F03).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	SPIKE LIMIT	SURGE LIMIT
FM-704A	16 to 40	2.50	60 dB @500 kHz	400 V, 0.5 $\Omega$ impedance	100 V, 0.5 $\Omega$ impedance



## FME270-461 EMI FILTERS—1.5 AMP

### Input voltage 270 VDC

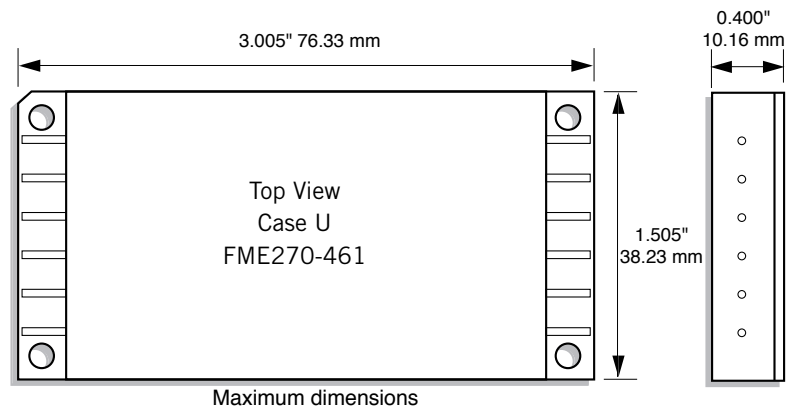
#### Attenuation 50 dB at 500 kHz, typical

- Operating temperature -55° to +125°C
- Nominal 270 V input, 0 V to 400 V operation
- Up to 1.5 A throughput current
- Compliant to MIL-STD-461C CE-03
- Compatible with the MHP270 converters

The FME270-461 filters will bring Interpoint high frequency power supplies into compliance with MIL-STD-461's CE03 limits for reflected ripple current. FME270 models are available in a flanged, side-leaded package (Case U). Operating temperature is -55 to +125°C.

FME270-461 filters are available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the MHP270 datasheet at [www.interpoint.com/F05](http://www.interpoint.com/F05).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FME270-461	0 to 400	1.50	40 dB @ 500 kHz	MHP270





## FMSA EMI FILTER—0.8 AMPS

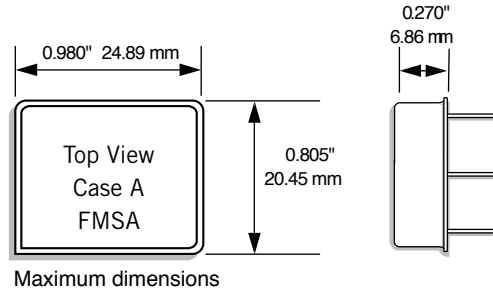
**Small footprint, 0.79 in<sup>2</sup> (5.1 cm<sup>2</sup>)**

**Attenuation 55 dB at 500 kHz**

- Operating temperature -55° to +125°C
- Nominal 28 V input, 0 V to 50 V operation
- Up to 0.8 A throughput current
- Compatible with MIL-STD-704 A-E 28 VDC power bus
- Compliant to MIL-STD-461C CE-03

The FMSA has been designed as a companion for our MSA and MCH converters. It can be used with multiple converters up to the rated current. The filter weighs 10.3 grams and is only 0.27 inches high. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FMSA datasheet at [www.interpoint.com/F07](http://www.interpoint.com/F07).

MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FMSA-461	0 to 50	0.80	55 dB @ 500 kHz	MSA, HSH, MCH



## FMGA EMI FILTER—0.8 AMPS

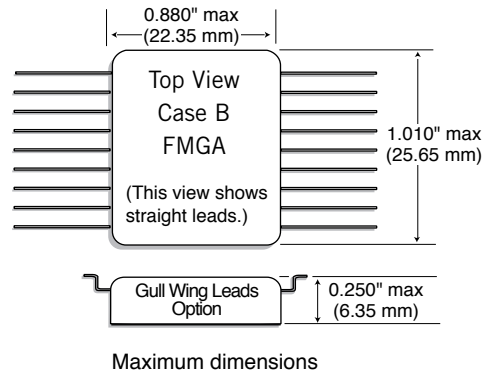
**Surface mount package, 0.89 in<sup>2</sup> (5.7 cm<sup>2</sup>)**

**Attenuation 55 dB at 500 kHz**

- Operating temperature -55° to +125°C
- Nominal 28 V input, 0 V to 50 V operation
- Up to 0.8 A throughput current
- Compatible with MIL-STD-704 A-E 28 VDC power bus
- Compliant to MIL-STD-461C CE-03

Our surface mount FMGA-461™ EMI filter has been designed to work with our surface mount MGA and MGH Series DC/DC converters. Multiple MGA or MGH Series converters can be operated from a single FMGA filter provided the total power/current line current does not exceed the filter's maximum rating. The FMGA filter will reduce the converter's power line reflected ripple current to within the limit of MIL-STD-461C, Method CE03. The filter uses only ceramic capacitors for reliable high-temperature operation. It weighs 10.3 grams and is only 0.25 inches high. Available with Standard, ES, or Class H, QML, Quality Assurance screening. See Screening Tables 1 and 2. For the most current specifications refer to the FMH datasheet at [www.interpoint.com/F08](http://www.interpoint.com/F08).

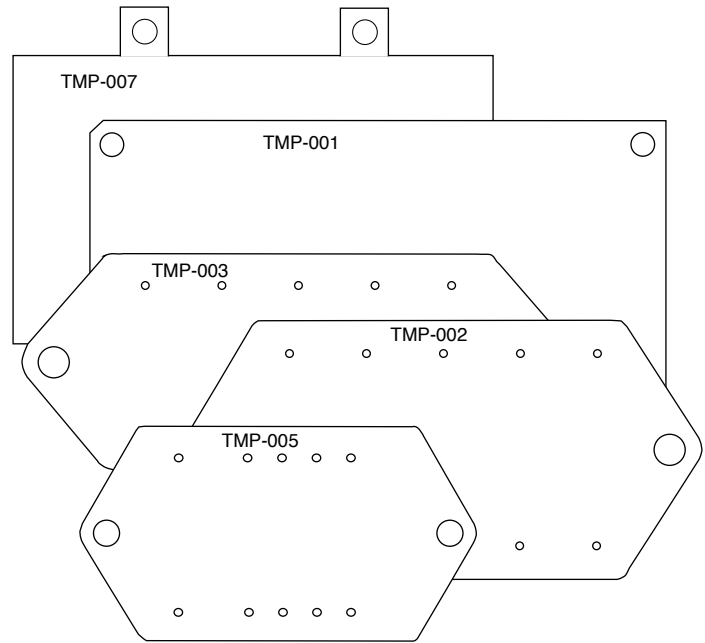
MODEL	VDC INPUT	MAXIMUM CURRENT (A)	MINIMUM ATTENUATION	COMPATIBLE CONVERTERS
FMGA-461	0 to 50	0.8	55 dB @ 500 kHz 50 dB @ 5 MHz	MGA, MGH



## THERMAL MOUNTING PAD (TMP)

- Temperature rating of -60°C to +200°C
- Provides thermal transfer for Interpoint converters
- Thermal impedance 0.46°C in<sup>2</sup>/W (297°C mm<sup>2</sup>/W)
- Breakdown voltage 4000 VAC

Our silicon/fiberglass thermal mounting pads provide a low thermal resistance path between the converter and the circuit board or heat sink, fill surface irregularities, and supply electrical insulation. Our thermal mounting pads are 0.010 inches (0.25 mm) thick, provide 0.23°C/W thermal resistance and a minimum breakdown voltage rating of 4000 Vac. For the most current specifications refer to the TMP datasheet at [www.interpoint.com/TMP](http://www.interpoint.com/TMP).

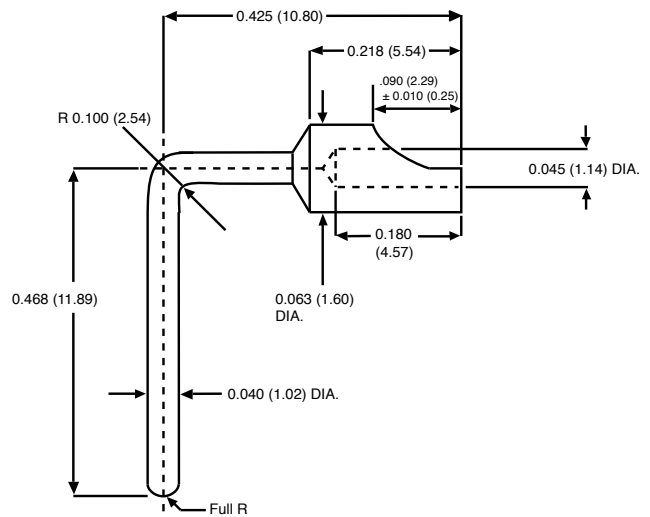


Thermal Pad	Case Number
TMP-001	U and Y
TMP-002	J
TMP-003	K
TMP-005	G
TMP-007	W, Y, and Z

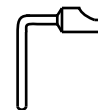
## PIN TERMINAL ADAPTOR

- Adapts Interpoint flanged, side-leaded cases to upleaded or downleaded 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 adaptors 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

## STANDARD AND /ES (NON-QML) AND /883 (CLASS H, QML) MIL-PRF-38534 ELEMENT EVALUATION

COMPONENT-LEVEL TEST PERFORMED	NON-QML	QML	
	STANDARD AND /ES	CLASS H /883	
	M/S <sup>2</sup>	M/S <sup>2</sup>	P <sup>3</sup>
Element Electrical	■	■	■
Visual		■	■
Internal Visual		■	
Final Electrical		■	■
Wire Bond Evaluation		■	■

## 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 element evaluation. Not applicable to Standard and /ES element evaluation.

SCREENING TABLE 1: ELEMENT EVALUATION - HIGH RELIABILITY

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

# STANDARD AND /ES (NON-QML) AND /883 (CLASS H, QML) MIL-PRF-38534 ENVIRONMENTAL SCREENING

TEST PERFORMED	NON-QML <sup>1</sup>		QML
	STANDARD	/ES	CLASS H /883
<b>Pre-cap Inspection, Method 2017, 2032</b>	■	■	■
<b>Temperature Cycle (10 times)</b>			
Method 1010, Cond. C, -65°C to +150°C, ambient			■
Method 1010, Cond. B, -55°C to +125°C, ambient		■	
<b>Constant Acceleration</b>			
Method 2001, 3000 g			■
Method 2001, 500 g		■	
<b>Burn-in Method 1015, +125°C case, typical <sup>2</sup></b>			
96 hours		■	
160 hours			■
<b>Final Electrical Test, MIL-PRF-38534, Group A,</b>			
Subgroups 1 through 6, -55°C, +25°C, +125°C case			■
Subgroups 1 and 4, +25°C case	■	■	■
<b>Hermeticity Test</b>			
Gross Leak, Method 1014, Cond. C		■	■
Fine Leak, Method 1014, Cond. A		■	■
Gross Leak, Dip	■		
<b>Final visual inspection, Method 2009</b>	■	■	■

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

Notes:

1. Standard and /ES, non-QML products, may not meet all of the requirements of MIL-PRF-38534.
2. Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.

SCREENING TABLE 2: ENVIRONMENTAL SCREENING - HIGH RELIABILITY

## STANDARD AND /ES (NON-QML) ENVIRONMENTAL SCREENING <sup>1, 2</sup>

TEST PERFORMED	NON-QML	
	STANDARD	/ES
<b>Pre-cap Inspection</b> Method 2017, 2032	■	■
<b>Temperature Cycle (10 times)</b> Method 1010, Cond. B, -55°C to +125°C, ambient		■
<b>Constant Acceleration</b> Method 2001, 500 g		■
<b>Burn-in</b> Method 1015 <sup>3</sup> 96 hours		■
<b>Final Electrical Test MIL-PRF-38534, Group A</b> Subgroups 1 and 4: +25°C case	■	■
<b>Hermeticity Test</b> Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip	■	■ ■
<b>Final visual inspection</b> Method 2009	■	■

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

Notes:

1. "Non-QML" Refers to products that do not offer QML screening.
2. Standard and /ES, non-QML products, may not meet all of the requirements of MIL-PRF-38534.
3. 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.

SCREENING TABLE 3: ENVIRONMENTAL SCREENING - HIGH RELIABILITY - NON-QML



# 

TEST PERFORMED	HSB STANDARD	HSB /ES
<b>Pre-cap Inspection</b> Method 2017, 2032	■	■
<b>Temperature Cycle (10 times)</b> Method 1010, Cond. B, -55°C to 125°C		■
<b>Constant Acceleration</b> Method 2001, 500 g		■
<b>Burn-in <sup>2</sup></b> 24 hours at 150°C case (typical) 96 hours at 150°C case (typical)	■	■
<b>Final Electrical Test MIL-PRF-38534, Group A</b> Subgroups 1, 2, 4, 5: +25°C, +125°C	■	■
<b>Hermeticity Test</b> Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip	■	■ ■
<b>Final visual inspection</b> Method 2009	■	■

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

Notes:

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

SCREENING TABLE 4: ENVIRONMENTAL SCREENING - HIGH RELIABILITY - HSB

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

### Aircraft

AAAdvanced Light Helicopter - ALH  
Airbus A319 - A380  
Airbus A400M  
AH-64 Apache  
ARJ21  
CX/PI  
EH101  
F-16  
B-1B Lancer  
B-2 Stealth Bomber  
B-52 Stratofortress  
Boeing 737 through 787  
E-2C Hawkeye  
F-2 Attack Fighter  
F-15 Eagle  
F-22 Raptor  
F-35 Joint Strike Fighter  
F/A-18 Hornet  
GRIPEN  
Hermes UAV  
Jaguar  
K8 Trainer  
Light Combat Aircraft - LCA  
Lynx Helicopters  
MI-8 Helicopters  
MIG Upgrades  
NH90 Helicopters  
Nimrod 2000  
OH1  
RC-135 Rivet Joint  
RQ-4A Global Hawk  
Typhoon - Eurofighter  
U-2 Falcon Hawk  
UH60JV-22 Osprey  
Watchkeeper UAV - UK  
X-45  
X-47 - UAV  
Z9 - Z10 Helicopters

### C4ISR

AEGIS (radar)  
Firefinder/Sentinel  
Border Security Camera System  
JTIDS/MIDS  
MILSTAR  
JSTAR

### Commercial/Industrial

Oil Rig- down hole instrumentation  
Oil platform system controls  
Oil and gas pipeline monitoring

### Land Systems

Challenger  
Leopard  
M1A1 Abrams  
Multiple Launch Rocket System - MLRS

### Naval Platforms

CVN-68 - Nimitz Class  
DDG-51 - Arleigh Burke Class  
DD(X)  
LHD & LHA Amphibious Assault Ship  
- Wasp and Tarawa Class  
SSN-774 Virginia-Class  
- New Attack Submarine - NSSN  
Trident Class Fleet  
- Ballistic Missile Submarine

### Precision Munitions

AGM-88 HARM  
AMRAAM Patriot  
BAMSE  
Dual Mode Guided Bomb - DMGB  
Evolved Sea Sparrow Missile - ESSM  
IRIS-T  
Taurus  
Harpoon  
Joint Air-to-Surface Standoff Missile  
- JASSM

Longbow  
PAC-3  
Tomahawk  
SeaRam  
Small Diameter Bomb - SDB  
Standard Missile II  
Wind Corrected Munition Dispenser  
- WCMD

### Radar/Electronic Warfare

Airborne Self-Protection Integrated Suites  
- ASPIS  
AN/AAR-57 Common Missile Warning  
System - CMWS  
APG-63  
APG-81  
AWACS  
Directional Infrared Counter Measure  
- DIRCM  
ERIEYE  
Giraffe Agile Multi Beam Radar  
SLQ-32

### Space

ACE  
Aquarius  
Cassini/Huygens  
GLONAS  
GONETS  
Hubble Space Telescope  
INTEGRAL  
Mars Exploration Rovers - MER  
Mars Reconnaissance Orbiter - MRO  
Mars Science Lab - MSL  
Phoenix  
ROCSAT  
Space Shuttle and Space Station

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