FEATURES

- **–55°C to +125°C operation**
- 50 dB minimum attenuation at 500 kHz
- Compliant to MIL-STD-461C, CE03
- Compatible with MIL-STD-704E DC power bus

EMI INPUT FILTER 28 VOLT INPUT

FMH EMI FILTER 1.5 AMP

MODEL	
FMH-461	1.5 amp

Size (max.): Non-flanged, case E3
1.460 x 1.130 x 0.330 (37.08 x 28.70 x 8.38 mm)
Flanged, case G3
2.005 x 1.130 x 0.330 inches (50.93 x 28.70 x 8.38 mm)
See Section B8, cases E3 and G3, for dimensions.
Weight: 22 grams typical, 28 grams maximum
Screening: Standard, ES, or 883 (Class H). See Section C2 for screening options, see Section A5 for ordering information.

DESCRIPTION

Interpoint specifically designed the FMH-461™ EMI filter to reduce the input line reflected ripple current of the following high frequency DC/DC converters: MHD, MHF, MHF+, MHV, MSA[1], and MTR series converters. It will also reduce EMI for several of Interpoint's lower frequency converters: MHE/MLP, MHL, MTO, and MTW series. The FMH-461 filter is ideal for use in applications which must meet MIL-STD-461C levels of conducted and radiated emissions. Throughput current is 1.5 amps. At 16 VDC input (low line), the filter provides 24 watts of throughput power.

MIL-STD NOISE MANAGEMENT

When used in conjunction with Interpoint converters, the FMH-461 EMI filter reduces input ripple current by 35 dB or greater at 200 kHz and by at least 50 dB at 500 kHz (see Figures 5 and 6 and electrical characteristics table). This attenuation gives the converter/filter combination performance which exceeds MIL-STD-461C's CE03 test.

FILTER OPERATION

FMH-461 filters are rated for full power operation from –55°C to +125°C baseplate temperature. Operation is offered up to the absolute maximum of +135°C with derating as defined in "Recommended Operating Conditions" on the following page. The maximum DC insertion loss at full load and nominal input voltage (28 VDC) represents a power loss of less than 2%.

LAYOUT REQUIREMENTS

The case of the filter must be connected to the case of the converter through a low impedance connection to minimize EMI.

1. MSA models may require an inductor in series with the MSA's positive input. 2 µH is the suggested value.

FMH EMI FILTER 1.5 AMP

EMI INPUT FILTERS

ABSOLUTE MAXIMUM RATINGS

Input Voltage
- 0 to 40 VDC continuous

Lead Soldering Temperature (10 sec per lead)
- 300°C

Storage Temperature Range (Case)
- –65°C to +150°C

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range
- 16 to 40 VDC continuous

Case Operating Temperature (Tc)
- –55°C to +125°C full power

Derating DC Input/Output current
- Derate linearly from 100% at 125°C to 0% at 135°C case

TYPICAL CHARACTERISTICS

Capacitance
- 0.024 µF max, any pin to case

Isolation
- 100 megohm minimum at 500 V
- Any pin to case, except case pin

Electrical Characteristics: 25°C Tc, nominal Vin, unless otherwise specified.

		FMH-461			
PARAMETER	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNITS**
INPUT VOLTAGE	CONTINUOUS	0	28	40	VDC
INPUT CURRENT		—	—	1.5	A
NOISE REJECTION	200 kHz	35	40	—	dB
	500 kHz	50	60	—	
DC RESISTANCE (R_{DC})	TC = 25°C	—	0.20	0.35	Ω
OUTPUT VOLTAGE[1]	STEADY STATE	$V_{OUT} = V_{IN} - I_{IN} (R_{DC})$			VDC
OUTPUT CURRENT	RIPPLE	—	—	0.3	A rms
	STEADY STATE	_	_	1.5	A
INTERNAL POWER DISSIPATION	MAXIMUM CURRENT	—	0.5	0.8	W

Notes
1. Typical applications result in Vout within 2% of Vin.

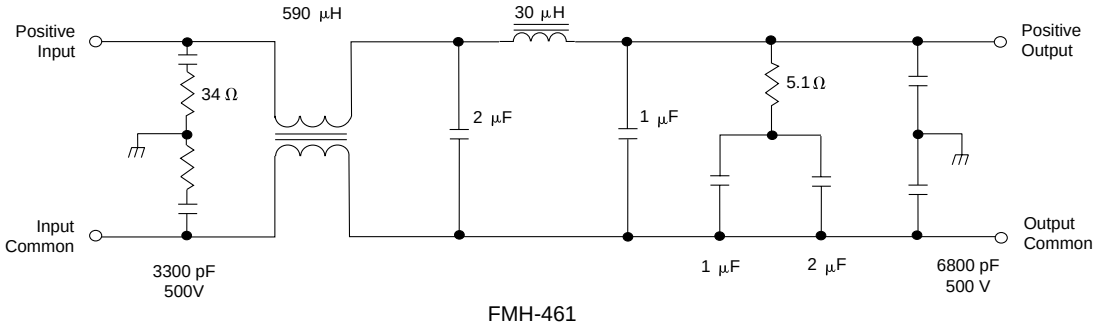

FIGURE 1: SCHEMATIC

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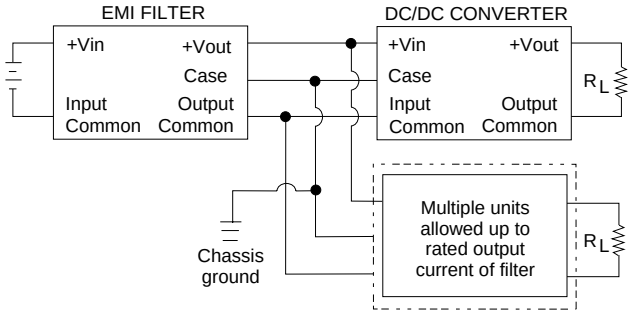
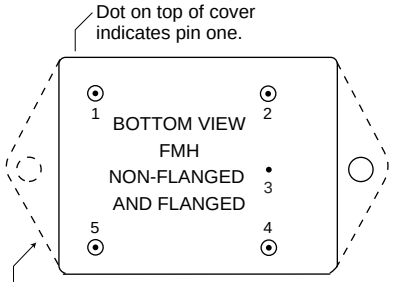


The case ground connection between the filter and the converter should be as low an impedance as possible to minimize EMI. Direct contact of baseplate to chassis ground provides the lowest impedance.

FIGURE 2: CONNECTION DIAGRAM

PIN OUT

Pin	Designation
1	Positive Input
2	Positive Output
3	Case Ground
4	Output Common
5	Input Common



Dotted line outlines flanged package option.

See Section B8, cases E3 and G3 for dimensions.

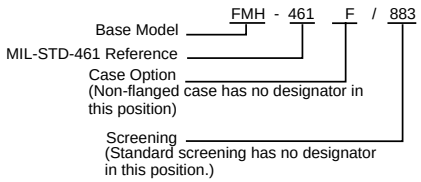
FIGURE 3: PIN OUT

DSCC NUMBER

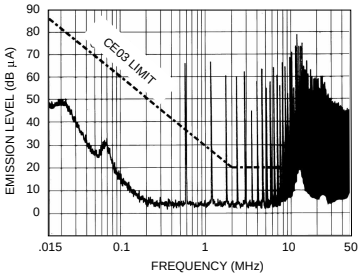
DSCC DRAWING (5915)	FMH-461 FILTER SIMILAR PART
95003-01HXC	FMH-461/883
95003-01HZC	FMH-461F/883

For exact specifications for a DSCC product, refer to the DSCC drawing. See Section A3, "SMD/DSCC Lists", for more information.

MODEL NUMBERING KEY

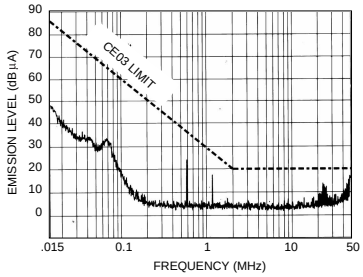


Typical Performance Curves: 25°C Tc , nominal Vin, unless otherwise specified.



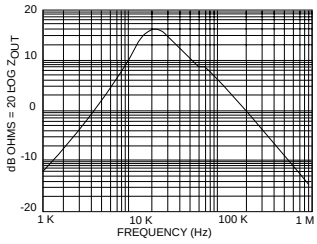
MHF+2805S Converter Without Filter

FIGURE 4



MHF+2805S Converter With FMH-461 Filter

FIGURE 5



Typical Output Impedance (Z)
With Input Shorted
FMH-461

FIGURE 6

26421-001-DTS Rev A DQ# 4044

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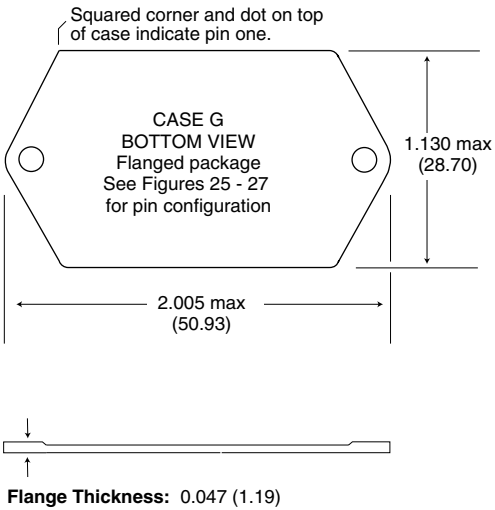


Materials

Header Cold Rolled Steel/Nickel/Gold
Cover MHF+ Series and FMH Filter
Kovar/Nickel
SMHF
Cold Rolled Steel/Nickel
Pins #52 alloy (all cases)
compression glass seal

Case dimensions in inches (mm)

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) for two decimal places
unless otherwise specified

CAUTION

Heat from reflow or wave soldering may damage the device. Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

FIGURE 24: CASE G MAXIMUM DIMENSIONS

BOTTOM VIEW CASE G1

Flanged cases: Designator "F" required in Case Option position of model number
MHF+ Series Single and Dual, LIM5050 Module: Screening – Standard, ES, or 883
SMHF Series, SLIM5050 Module: Screening – Space Standard, H, or K

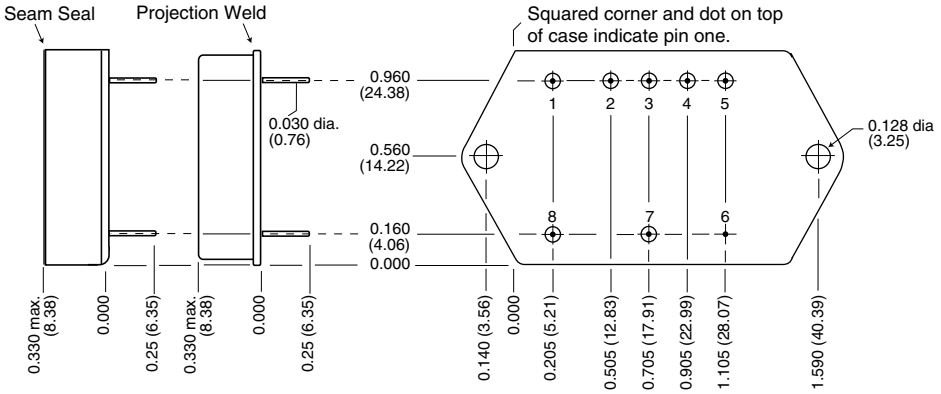


FIGURE 25: CASE G1

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

BOTTOM VIEW CASE G2

Flanged case: Designator required in Case Option position of model number.
MHF+ Series Triple: Screening – Standard, ES, or 883

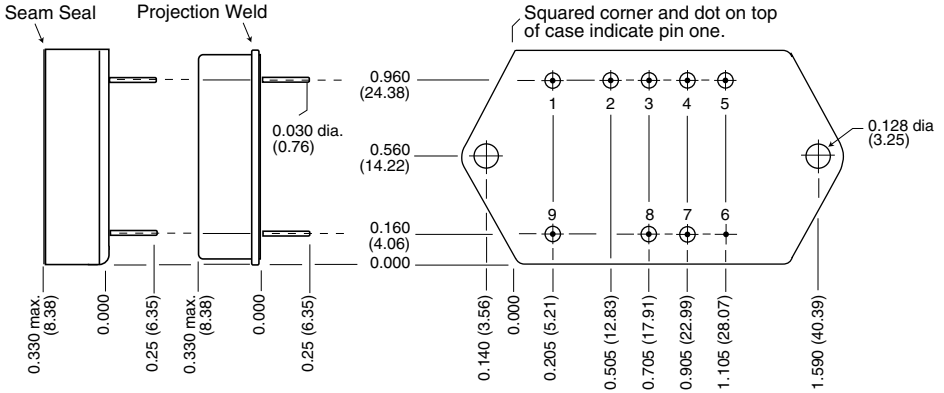


FIGURE 26: CASE G2

BOTTOM VIEW CASE G3

Flanged case: Designator required in Case Option position of model number.
FMH EMI Filter: Screening – Standard, ES, or 883

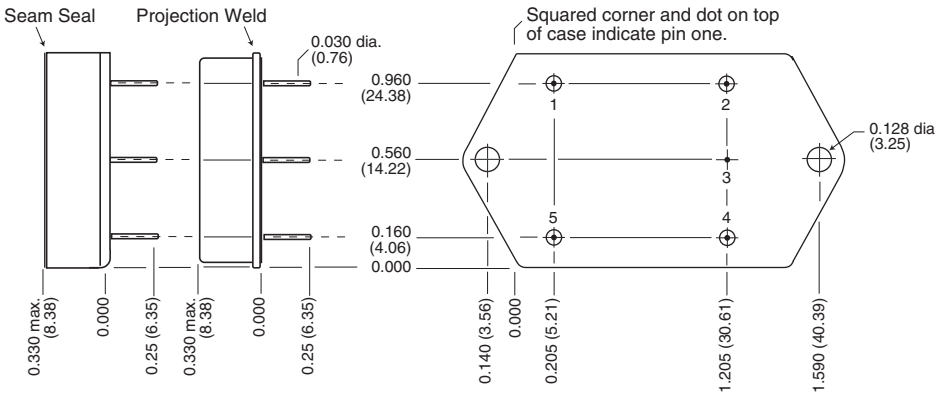
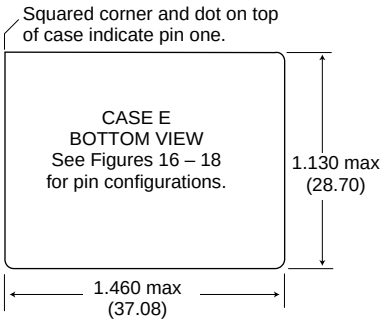


FIGURE 27: CASE G3

CASES



Materials

Header	Cold Rolled Steel/Nickel/Gold
Cover	Kovar/Nickel (SMHF Series Cold Rolled Steel/Nickel/Gold)
Pins	#52 alloy/Gold compression glass seal

Case dimensions in inches (mm)

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION

Heat from reflow or wave soldering may damage the device. Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

FIGURE 15: CASE E MAXIMUM DIMENSIONS

BOTTOM VIEW CASE E1

MHF+ Series Single and Dual: Screening – Standard, ES, or 883
MHF Series and LIM5050 Module: Screening – Standard or ES
SMHF Series Single and Dual and SLIM5050 Module:
Screening – Space Standard, H, or K
HR120 Series: No screening options

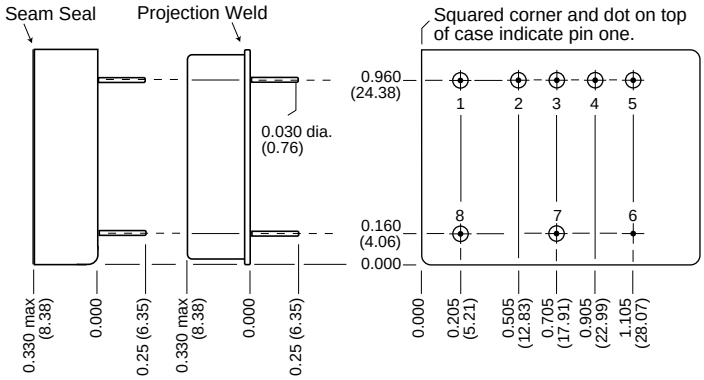


FIGURE 16: CASE E1

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

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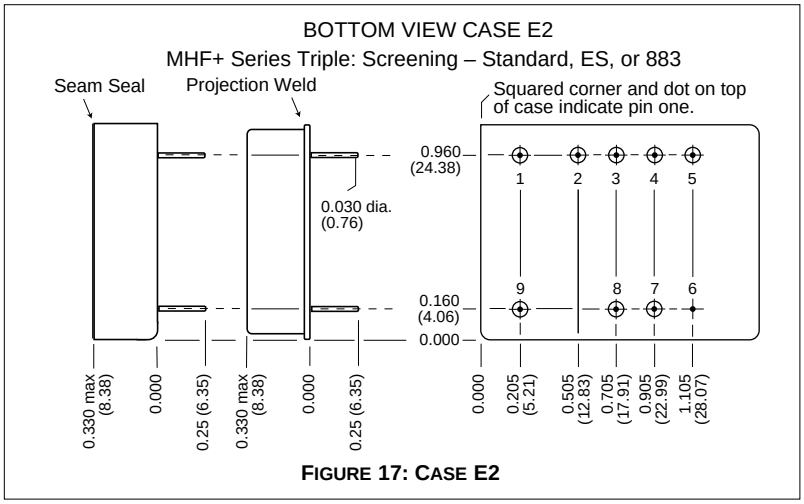

FIGURE 17: CASE E2

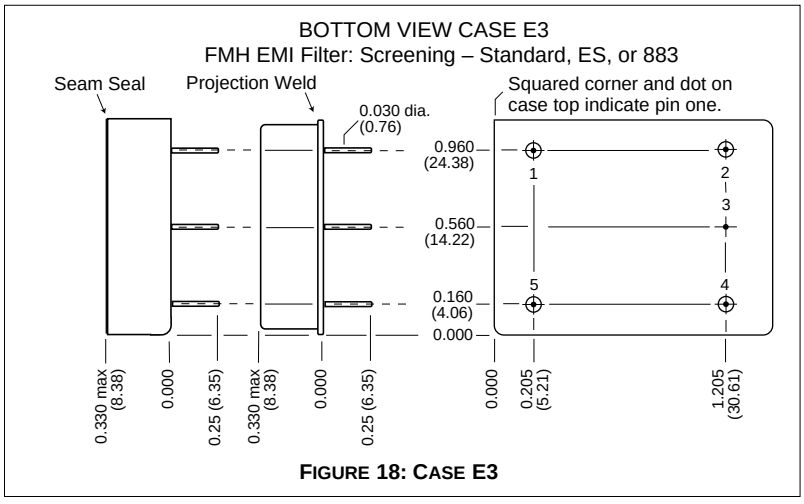

FIGURE 18: CASE E3

125°C PRODUCTS

TEST (125°C Products)	STANDARD	/ES	/883 (Class H)*
PRE-CAP INSPECTION			
Method 2017, 2032	yes	yes	yes
TEMPERATURE CYCLE (10 times)			
Method 1010, Cond. C, -65°C to 150°C	no	no	yes
Method 1010, Cond. B, -55°C to 125°C	no	yes	no
CONSTANT ACCELERATION			
Method 2001, 3000 g	no	no	yes
Method 2001, 500 g	no	yes	no
BURN-IN			
Method 1015, 160 hours at 125°C	no	no	yes
96 hours at 125°C case (typical)	no	yes	no
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A			
Subgroups 1 through 6: -55°C, +25°C, +125°C	no	no	yes
Subgroups 1 and 4: +25°C case	yes	yes	no
HERMETICITY TESTING			
Fine Leak, Method 1014, Cond. A	no	yes	yes
Gross Leak, Method 1014, Cond. C	no	yes	yes
Gross Leak, Dip (1 x 10^{-3})	yes	no	no
FINAL VISUAL INSPECTION			
Method 2009	yes	yes	yes

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

*883 products are built with element evaluated components and are 100% tested and guaranteed over the full military temperature range of –55°C to +125°C.

Applies to the following products

MOR Series	MHD Series	MGH Series	FMGA EMI Filter
MFLHP Series	MHV Series	MCH Series	FMSA EMI Filter
MFL Series	MHF+ Series	FM-704A EMI Filter	HUM Modules**
MHP Series	MHF Series**	FMD**/FME EMI Filter	LCM Modules**
MTR Series	MGA Series	FMC EMI Filter	LIM Modules
MQO Series**	MSA Series	FMH EMI Filter	

**MFLHP Series, MQO Series, MHF Series, FMD EMI Filters, Hum Modules, and LCM Modules do not offer ‘883” screening.