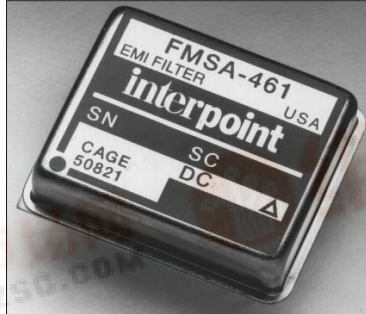


## FEATURES

- -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

## FMSA EMI FILTER 0.8 AMP



MODEL	
FMSA-461	0.8 amp

Size (max.): 0.980 x 0.805 x 0.270 (24.89 x 20.45 x 6.86 mm)

See cases "A maximum dimensions" and "A1" for dimensions.

Weight: 10.3 grams typical, 11.5 grams maximum

Screening: Standard, ES or Class H

See "QA Screening: Class H, QML" for more information.

## DESCRIPTION

The FMSA-461 EMI filter module has been designed as a companion for Interpoint MSA flyback power converters. Multiple MSA power converters can be operated from a single filter provided the total power line current does not exceed the filter maximum rating. The FMSA filter will reduce the MSA's power line reflected ripple current to within the limit of MIL-STD-461C, Method CE03, as shown in the example of Figures 4 and 5.

The FMSA is fabricated using thick film hybrid technology and is sealed in a metal package for military, aerospace and other applications requiring EMI suppression. The filter uses only ceramic capacitors for reliable high temperature operation.

## OPERATION

The MSA power converter has an internal 2  $\mu$ F capacitor across its input power terminals. When the MSA and FMSA filters are used together, this capacitor becomes part of the filter and forms its final LC output section. When 2 or 3 MSAs are used with a single filter, this capacitor becomes 4  $\mu$ F or 6  $\mu$ F respectively, rather than 2  $\mu$ F, improving the rejection vs. frequency.

The FMSA filter can also be used with other types of Interpoint power converters (MHF, MHF+, MHE, MHD, and DCH series) to comply with CE03. For MHF, MHF+, MHD, and MHE models, the converter has an LC type line filter such that an inductor is seen looking into its positive input terminal. For these converters, it is necessary to terminate the filter with a capacitor to insure unconditionally stable operation. A capacitor across the filter output terminals of greater than 4  $\mu$ F or the optional damping circuit shown on the connection diagram will be adequate for stable operation. No capacitor is required for MSA, or DCH models.

## OPTIONAL DAMPING CIRCUIT

The optional damping circuit (Figure 2) can be used to prevent filter overshoot caused by MIL-STD-704A 80 V, or other, transients having rise times of less than 200  $\mu$ Sec. This damping can be alternatively provided with a 1.50  $\Omega$  resistor in series with the filter positive input where the additional line loss can be tolerated. For transients with rise times of greater than 200  $\mu$ sec, there is no overshoot and the damping circuit is not required.

## LAYOUT REQUIREMENTS

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

# FMSA EMI FILTER

## 0.8 AMP

# EMI INPUT FILTERS

### ABSOLUTE MAXIMUM RATINGS

#### Input Voltage

- 0 to 50 VDC continuous
- 80 V for 100 ms transient

#### 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 Input/Output Current

- Derate linearly from 100% at 100°C to 0.60 amps at 125°C case. Above 125°C derate to 0%.

### TYPICAL CHARACTERISTICS

#### Capacitance

- 0.045  $\mu$ F max, any pin to case

#### Isolation

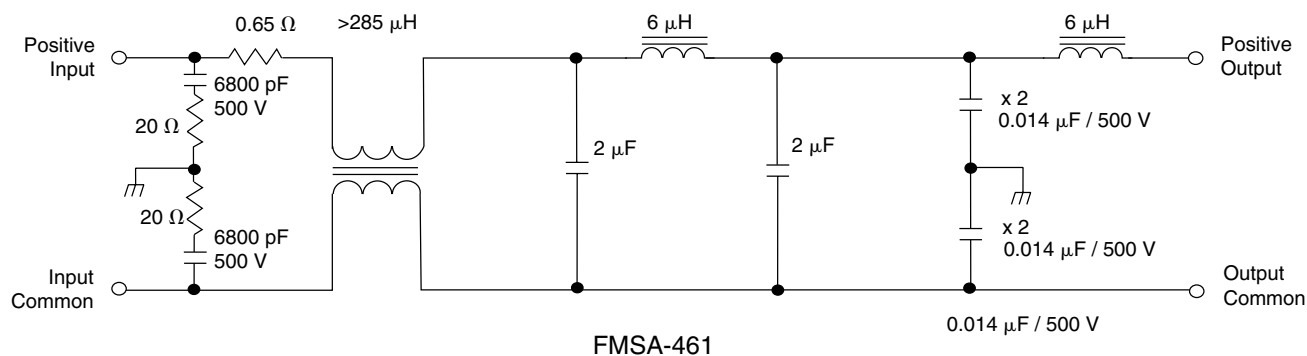
- 100 megohm minimum at 500 V
- Any pin to case, except case pin

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

PARAMETER	CONDITIONS	FMSA-461			UNITS
		MIN	TYP	MAX	
INPUT VOLTAGE	CONTINUOUS	0	28	40	VDC
	TRANSIENT <sup>1</sup> , 100 ms	—	—	80	V
INPUT CURRENT <sup>1</sup>		—	—	0.80	A
NOISE REJECTION	500 kHz	50	—	—	dB
	1 MHz	50	—	—	
NOISE REJECTION	5 MHz	45	—	—	dB
DC RESISTANCE (R <sub>DC</sub> )	TC = 25°C	—	—	1.2	$\Omega$
OUTPUT VOLTAGE	STEADY STATE	$V_{OUT} = V_{IN} - I_{IN} (R_{DC})$			VDC
OUTPUT CURRENT	STEADY STATE (<100°C CASE)	—	—	0.80	A
INTERNAL POWER DISSIPATION	MAXIMUM CURRENT	—	—	0.96	W

Notes:

1. Guaranteed by design, not tested.

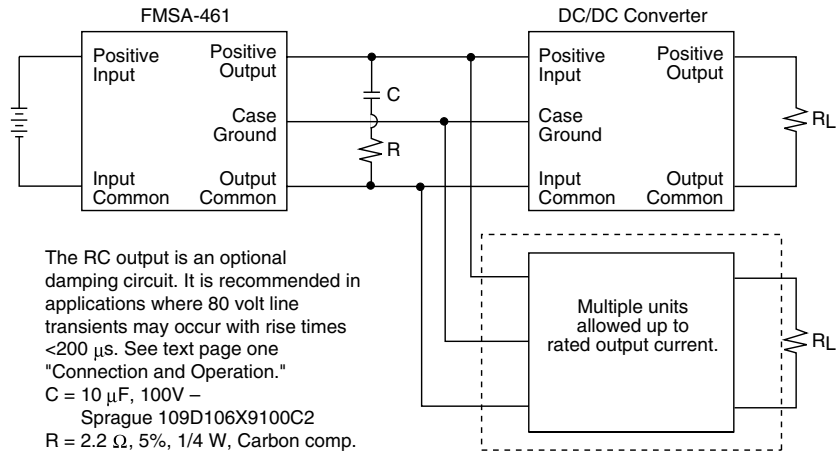


The case ground connection between the filter and the converter should be as low an impedance as possible to minimize EMI. Direct contact of baseplate to chassis ground provides the lowest impedance.

FIGURE 1: SCHEMATIC – TYPICAL VALUES

# EMI INPUT FILTERS

## FMSA EMI FILTER 0.8 AMP

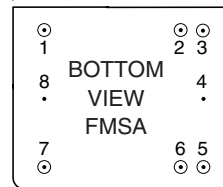


**FIGURE 2: DAMPING CIRCUIT**

### PIN OUT

Pin	Designation
1	Positive Input
2, 3	Positive Output
4	Case Ground
5, 6	Output Common
7	Input Common
8	Case Ground

Squared corner and dot on top of cover indicate pin one.



See cases "A maximum dimensions" and "A1" for dimensions.

**FIGURE 3: PIN OUT**

### DSCC NUMBER

DSCC DRAWING  
(5915)

96003-01HXC

FMSA-461 FILTER  
SIMILAR PART

FMSA-461/883

For exact specifications for a DSCC product, refer to the DSCC drawing: <http://www.dsccl.dla.mil/programs/smcr>

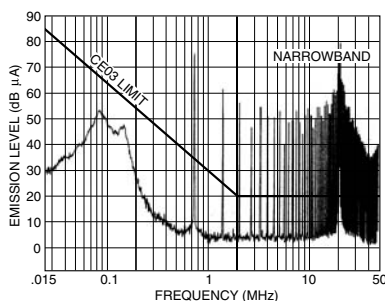
### MODEL NUMBERING KEY

Base Model FMSA - 461 / 883  
MIL-STD-461 Reference                       
Screening                       
(Standard screening has no designator in this position.)

# FMSA EMI FILTER 0.8 AMP

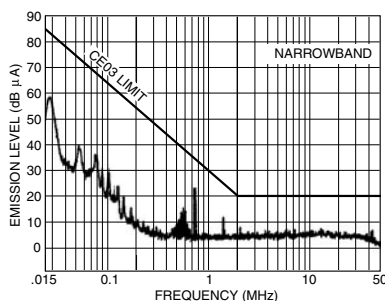
# EMI INPUT FILTERS

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



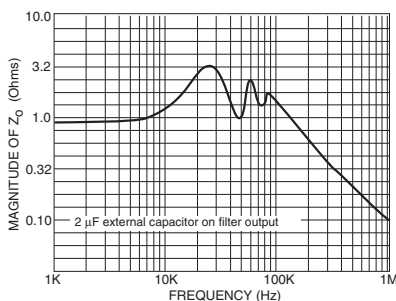
MSA2805S converter without a filter.

FIGURE 4



MSA2805S converters at full load with  
an FMSA-461 EMI filter

FIGURE 5

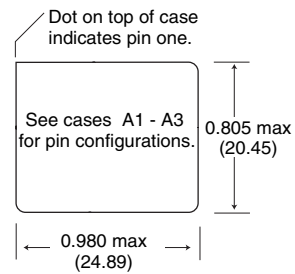


Typical Output Impedance (Z)  
With Input Shorted  
FMSA-461 EMI Filter

FIGURE 6

# CASES

## CASE A MAXIMUM DIMENSIONS BOTTOM VIEW



### Materials

Header	Cases A1 and A2 Kovar/Nickel/Gold Case A3 Kovar/Nickel)
Cover	Kovar/Nickel
Pins	Kovar/Nickel/Gold, matched glass seal

### Case dimensions in inches (mm)

Tolerance  $\pm 0.005$  (0.13) for three decimal places  
 $\pm 0.01$  (0.3) for two decimal places  
unless otherwise specified

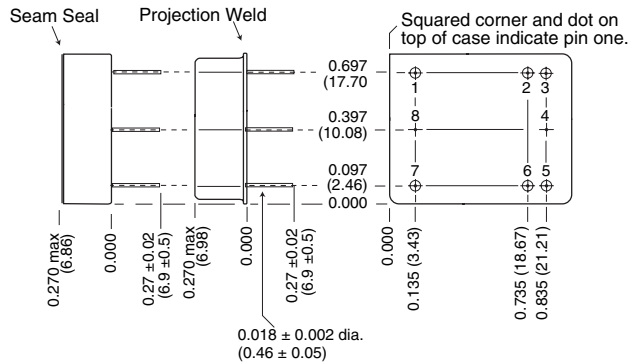
### CAUTION

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.

Case A maximum dimensions, Rev B, September 23, 2005  
Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.  
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# CASES

BOTTOM VIEW CASE A1  
FMSA EMI Filter and STF EMI Filter



Seal hole: 0.056 ± 0.002 (1.42 ± 0.05)

## 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

Case A1, Rev B, September 8, 2005

Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.

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# QUALITY ASSURANCE

## CLASS H, QML SCREENING

TEST	125°C STANDARD non-QML	125°C /ES non-QML	Class H /883 QML
Pre-cap Inspection Method 2017, 2032	yes	yes	yes
Temperature Cycle (10 times) Method 1010, Cond. C, -65°C to 150°C, ambient Method 1010, Cond. B, -55°C to 125°C, ambient	no no	no yes	yes no
Constant Acceleration Method 2001, 3000 g Method 2001, 500g	no no	no yes	yes no
Burn-In Method 1015, 160 hours at 125°C case, typical 96 hours at 125°C case, typical	no no	no yes	yes no
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 through 6: -55°C, +25°C, +125°C case Subgroups 1 and 4: +25°C case	no yes	no yes	yes no
Hermeticity Test Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip (1 x 10 <sup>-3</sup> )	no no yes	yes yes no	yes yes no
Final Visual Inspection Method 2009	yes	yes	yes

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