FEATURES

- **–55°C to +85°C operation**
- 50 dB minimum attenuation at 500 kHz
- Compliant to MIL-STD-461C, CE03
- Overvoltage protection

EMI INPUT FILTER 28 VOLT INPUT

MSF EMI FILTER 0.8 AMP

MODEL	
MSF-461	0.8 amp

Size (max.): 1.075 x 1.075 x 0.370 (27.31 x 27.31 x 9.40 mm)
See Section B8, cases C3, for dimensions.
Weight: 15 grams typical, 16 grams maximum
Screening: Standard or ES. See Section C2 for screening options, see Section A5 for ordering information.

DESCRIPTION

The MSF-461 EMI filter module has been specifically designed to reduce the input line reflected ripple current of Interpoint's MSR and DCH Series of DC/DC converters. They are intended for use in applications where switch-mode DC/DC converters, operating at a frequency of higher than 50 kHz, must meet MIL-STD-461C levels of conducted power line noise.

MSF-461 EMI filters are built using thick-film hybrid technology and are sealed in metal packages for military, aerospace, and other high-reliability applications. See Section B8, case C3, for dimensions. See Section C2 for screening options.

MIL-STD NOISE MANAGEMENT

When used in conjunction with Interpoint's DC/DC converters (see connection diagram, Figure 2), the input ripple current will be reduced by 50 dB within the frequency band of 50 kHz to 50 MHz. This gives the filter/converter combination a performance which exceeds the CE03 test limit of MIL-STD-461C. The CE03 performance of a model MSR2812D converter with and without the MSF-461 filter is shown in Figures 4 and 5.

FILTER OPERATION

The MSF-461 filters are rated to operate, with no degradation of performance, over the temperature range of –55°C to +85°C (as measured at the baseplate). Above 85°C, input voltage and current must be derated as specified in "Derating" on the following page. The maximum power dissipation of 0.62 watts (at maximum input current) represents a power loss of less than 10% at typical input voltage.

LAYOUT REQUIREMENTS

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

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)
- –55°C to +125°C

DERATING

Input Voltage
Derate linearly from 100% at 85°C case to the 33 VDC at 125°C case

DC Input and Output Current
Derate linearly from 100% at 85°C case to 150 mA at 125°C case.

TYPICAL CHARACTERISTICS

Capacitance
- 6600 pF max, any pin to case

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

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range
- 0 to 40 VDC continuous

Case Operating Temperature (Tc)
- –55°C to +85°C full power

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

		MSF-461			
PARAMETER	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNITS**
INPUT VOLTAGE	CONTINUOUS	0	28	40	VDC
INPUT CLAMPING VOLTAGE	–55°C	38.9	43.2	47.5	VDC
	25°C	42.3	47.0	51.7	
	85°C	44.9	49.9	54.8	
INPUT CURRENT		—	—	420	mA DC
NOISE REJECTION		50	—	—	dB
DC RESISTANCE[1] (R_{DC})	TC = 25°C	3.00	3.20	3.50	Ω
OUTPUT VOLTAGE[2]	STEADY STATE	$V_{OUT} = V_{IN} - I_{IN}$ (R_{DC})			VDC
OUTPUT CURRENT	STEADY STATE, 28 Vin	—	—	420	mA
INTERNAL POWER DISSIPATION	MAXIMUM CURRENT	—	—	0.62	W

Notes
1. DC resistance measured using four wire technique.
2. Typical applications result in Vout within 5% of Vin.

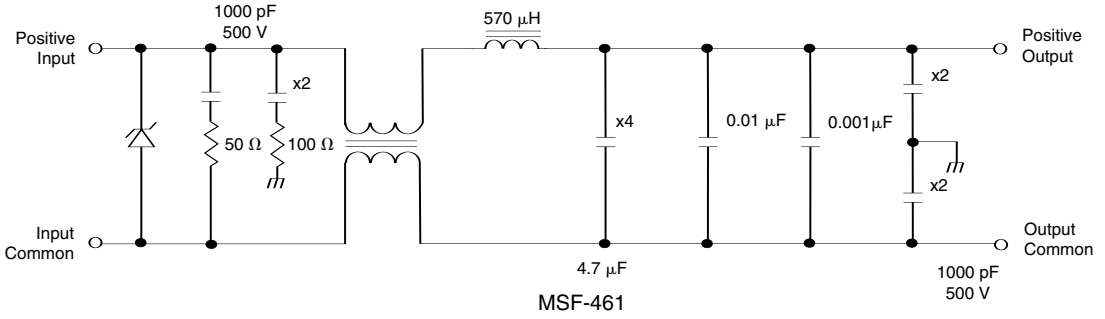


FIGURE 1: SCHEMATIC

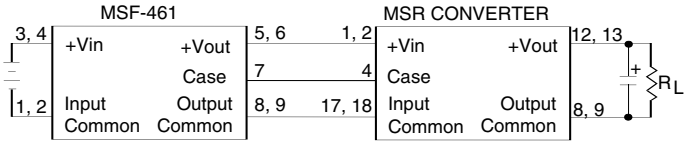
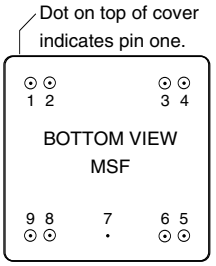


FIGURE 2: CONNECTION DIAGRAM

PIN OUT

Pin	Designation
1, 2[1]	Input Common
3, 4[1]	Positive Input
5, 6[1]	Positive Output
7	Case Ground
8, 9[1]	Output Common

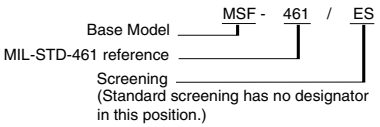
Note
1. Make external connections to both pins.



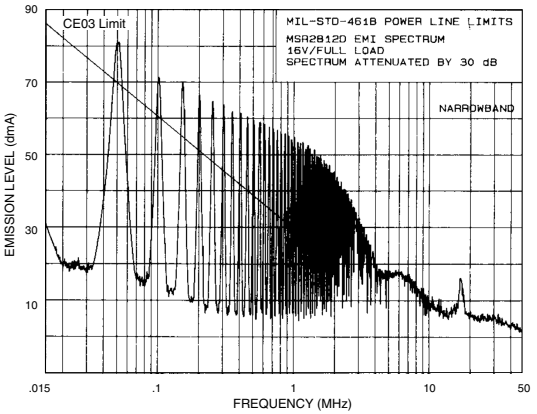
See Section B8, case C3, for dimensions.

FIGURE 3: PIN OUT

MODEL NUMBERING KEY

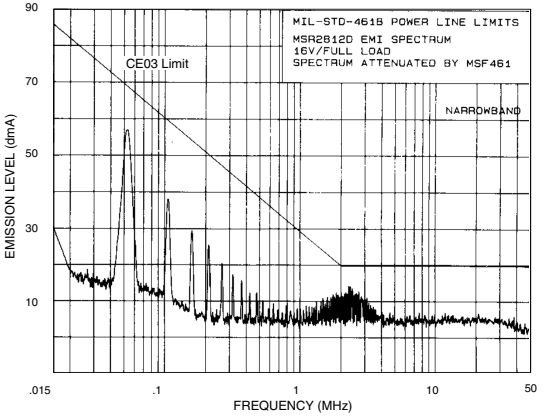


Typical Performance Curves: 25°C Tc , nominal Vin, unless otherwise specified.



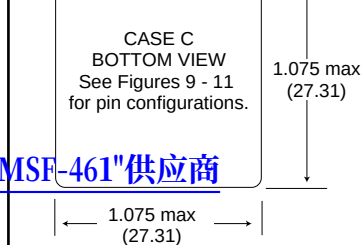
Narrowband spectrum of an MSR2812D converter without an EMI filter.

FIGURE 4



Narrowband spectrum of an MSR2812D converter with an MSF-461 filter on the input line.

FIGURE 5



Materials

Header Case C1
Cold Rolled Steel/Nickel/Gold
Cases C2 and C3
Kovar/Nickel/Tin

Cover Case C1
Cold Rolled Steel/Nickel
Cases C2 and C3
Kovar/Nickel/Tin

Pins Case C1
Copper/Nickel/Gold
Cases C2 and C3
Kovar/Nickel/Gold,
matched 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 8: CASE C MAXIMUM DIMENSIONS

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.

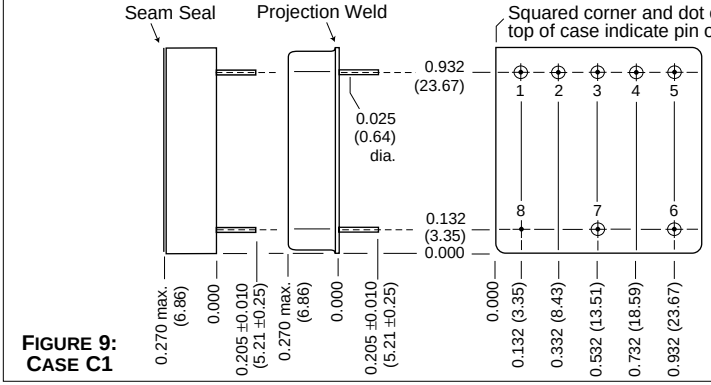


FIGURE 9: CASE C1

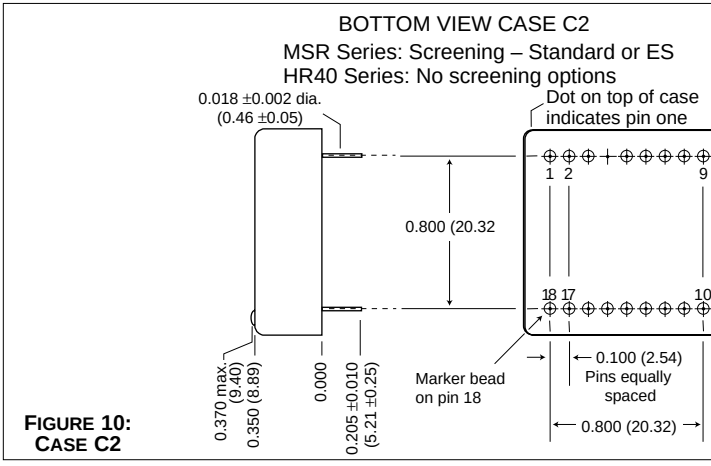


FIGURE 10: CASE C2

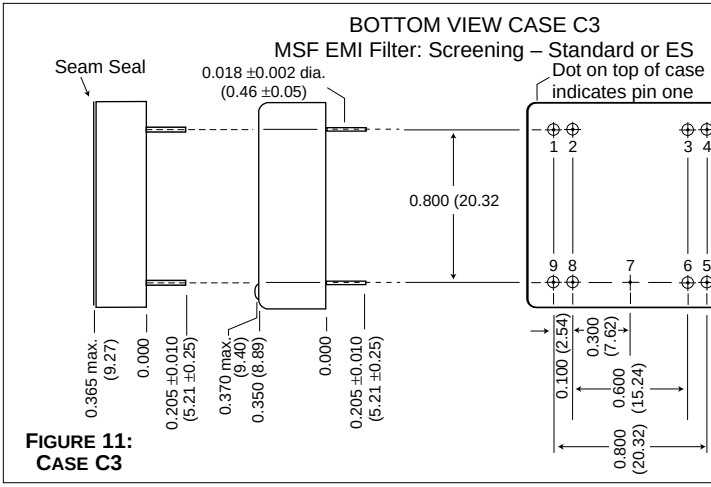


FIGURE 11: CASE C3

TEST (85°C Products excluding HR products)	STANDARD	/ES
PRE-CAP INSPECTION		
Method 2017	yes	yes
TEMPERATURE CYCLE (10 times)		
Method 1010, Cond. B, -55°C to 125°C	no	yes
CONSTANT ACCELERATION		
Method 2001, 500 g	no	yes
BURN-IN		
96 hours at 70°C ambient (typical)	no	yes
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A		
Subgroups 1 and 4: +25°C case	yes	yes
HERMETICITY TESTING		
Fine Leak, Method 1014, Cond. A	no	yes
Gross Leak, Method 1014, Cond. C	no	yes
Gross Leak, Dip (1 x 10^{-3})	yes	no
FINAL VISUAL INSPECTION		
Method 2009	yes	yes

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

Applies to the following products:

MFW Series
MTW Series
MHE/MLP Series
MHL Series
MRH Series
MTO Series
MSR Series
DCH Series
FM/FMA/FMB EMI Filters
MSF EMI Filter