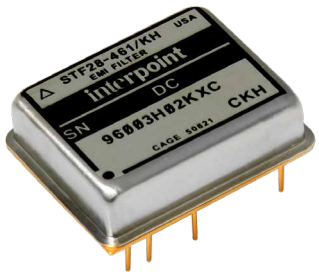
STF28-461 EMI Input Filters

28 VOLT INPUT – 0.8 AMP

FEATURES

- Attenuation 55 dB at 500 kHz
- Small size, 0.79 in^2 (5.1 cm^2)
- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Passive components used for maximum tolerance in space environments
- Nominal 28 volt input, 0 to 50 volt operation
- Up to 0.8 amp throughput current
- Compliant to MIL-STD-461C CE03
- Compatible with MIL-STD-704 A-E dc voltage transient surges



STF28-461	
INPUT (V)	CURRENT (A)
0 - 50	8

DESCRIPTION

The Interpoint® STF28-461 Series™ of EMI Filters offers up to 0.8 amps of throughput current. The low profile STF28-461 filters are manufactured in our fully certified and qualified MIL-PRF-38534 Class K production facility and packaged in hermetically sealed steel cases. They are ideal for use in programs requiring high reliability, small size, and high levels of radiation hardness assurance. It has been designed as a companion for the Interpoint SMSA flyback power converters. Multiple SMSA power converters can be operated from a single filter provided the total power line current does not exceed the filter's maximum rating. The STF28-461 filter will reduce the SMSA's power line reflected ripple current to within the limit of MIL-STD-461C, Method CE03.

OPERATION

The SMSA power converter has an internal 2 μF ceramic capacitor across its input power terminals. When the SMSA and STF filters are used together, this capacitor becomes part of the filter and forms its final LC output section. The STF filter provides both differential and common mode rejection bringing DC-DC converters into compliance with MIL-STD-461C CE03. It is designed to be used with the SMSA, SMHF, and SLH Series of converters. The STF filter can be used with multiple converters up to the rated current of the filter. For more information, contact your Interpoint product representative.

For SMHF and SLH converters a 4 μF (or greater) ceramic cap is needed between the filter and converter to complete the last inductive stage of this STF filter. This will ensure unconditional stability when used with the SMHF or SLH. The SMSA does not require this.

OPTIONAL DAMPING CIRCUIT

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

SCREENING

The STF28-461 filter offers three screening options: Space Prototype (O), Class H, or Class K. Radiation tolerant to Radiation Hardness Assurance (RHA) levels of "-" (O) or "H", per MIL-PRF-38534. Interpoint model numbers use an "O" in the RHA designator position to indicate the "-" (dash) Radiation Hardness Assurance level of MIL-PRF-38534, which is defined as "no RHA". See Table 7 on page 8 for more information
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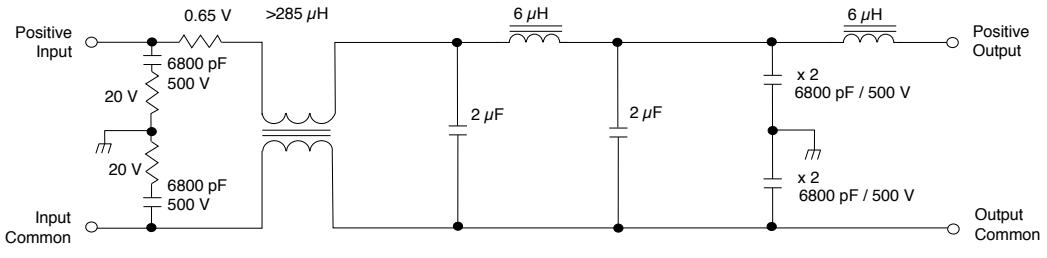
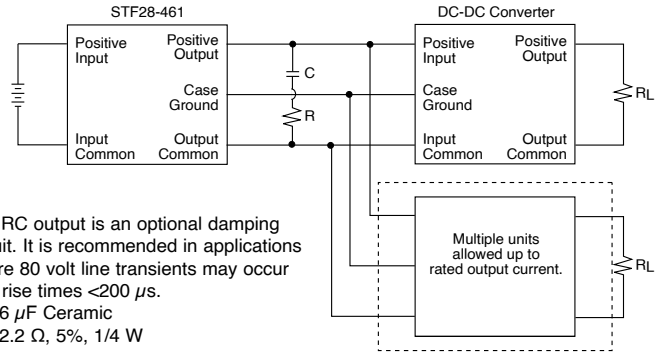


STF28-461

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

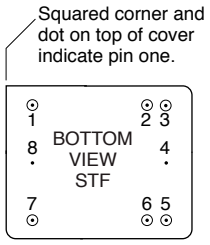


The RC output is an optional damping circuit. It is recommended in applications where 80 volt line transients may occur with rise times <200 µs.
C = 6 µF Ceramic
R = 2.2 Ω, 5%, 1/4 W

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

TABLE 1: PIN OUT



See Figure 5 on page 6 for dimensions.

FIGURE 3: PIN OUT

STF28-461 EMI Input Filters

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MODEL NUMBERING KEY

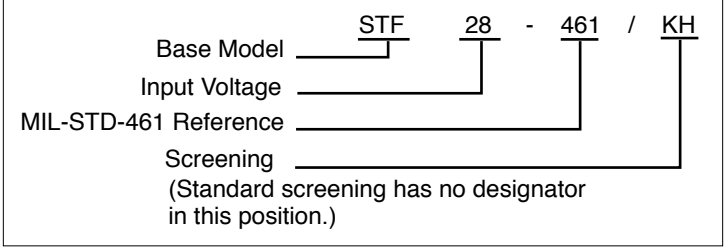

FIGURE 4: MODEL NUMBERING KEY

DLA NUMBERS

DLA DRAWING (5915)	STF28-461 SIMILAR PART
96003H02HXA	STF28-461/HH
96003H02HXC	STF28-461/HH
96003H02KXA	STF28-461/KH
96003H02KXC	STF28-461/KH

For exact specifications for a DLA product, refer to the DLA drawing. DLA drawings can be downloaded from: https://landandmaritimeapps.dla.mil/programs/smcr

TABLE 2: DLA CROSS REFERENCE

MODEL NUMBER OPTIONS

TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.

CATEGORY	Base Model and Input Voltage	Screening [1]	RHA [2]
OPTIONS	STF28-461	O H K	O H
FILL IN FOR MODEL # [3]	STF28-461	_____	/ _____

Notes
1. Screening: A screening level of O is a Space Prototype and is only used with RHA O. See Table 6 on page 8 and Table 7 on page 9 for more information. “H” indicates Class H and “K” indicates Class K of MIL-PRF-38534.
2. RHA: Interpoint model numbers use an “O” in the RHA designator position to indicate the “-” (dash) Radiation Hardness Assurance level of MIL-PRF-38534, which is defined as “no RHA.” RHA O is only available with Screening level O. See Table 7 on page 9 for more information.
3. If ordering by model number add a “-Q” to request solder dipped leads (STF28-461/KH-Q).

TABLE 3: MODEL NUMBER OPTIONS

STF28-461 EMI Input Filters

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TABLE 4: OPERATING CONDITIONS: 28 VIN, UNLESS OTHERWISE SPECIFIED.

MODEL		FMCE-0528			
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
LEAD SOLDERING TEMPERATURE [1]	10 SECONDS MAX.	—	—	300	°C
STORAGE TEMPERATURE [1]		-65	—	+150	°C
CASE OPERATING	FULL POWER	-55	—	+125	°C
TEMPERATURE [1]	ABSOLUTE	-55	—	+135	
DERATE (RDC) [1]	LINEARLY	From 100% at 125°C to 0% at 135°C			
ESD RATING [1, 2]	MIL STD 883 METHOD 3015	—	—	>8000	V
MIL-PRF-38534, 3.9.5.8.2	CLASS 3B				
ISOLATION, ANY PIN TO CASE	500 VDC AT 25°C	100	—	—	Megohms
EXCEPT CASE PIN					

1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Passes 8000 volts.

TABLE 5: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 28 VIN, UNLESS OTHERWISE SPECIFIED.

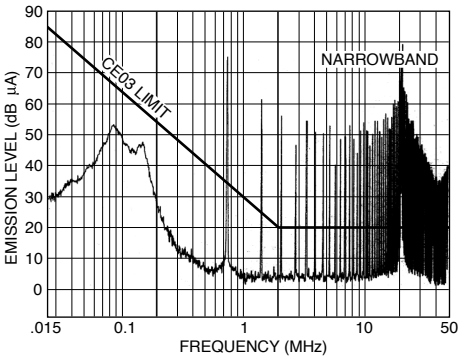
MODEL		STF28-461			
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT VOLTAGE [1]	CONTINUOUS	0	28	50	V
	TRANSIENT 100 ms	—	—	80	
NOISE REJECTION	500 kHz	50	—	—	dB
DIFFERENTIAL NOISE	1 MHz	50	—	—	
DC RESISTANCE (RDC)	T_C = 25°C	—	—	1.2	Ω
CAPACITANCE 25°C	ANY PIN TO CASE	—	—	45,000	pF
	EXCEPT CASE PIN				
OUTPUT VOLTAGE [1]	STEADY STATE	VOUT = V_{IN} - I_{IN} (RDC)			V
OUTPUT CURRENT [1]	STEADY STATE	—	—	0.80	A
POWER DISSIPATION [1]	T_C = 25°C	—	—	1.15	W

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.

STF28-461 EMI Input Filters

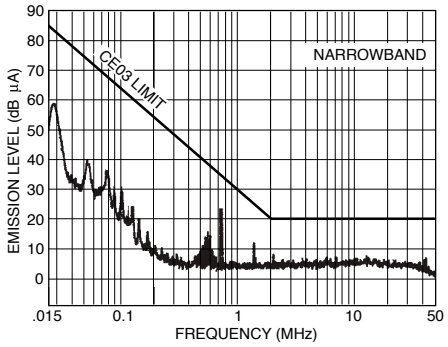
28 VOLT INPUT – 0.8 AMP

TYPICAL PERFORMANCE PLOTS: 25°C CASE, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY. NOT GUARANTEED SPECIFICATIONS.



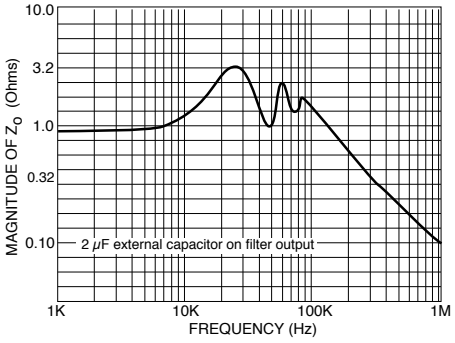
MSA2805S converter without a filter.

FIGURE 4



MSA2805S converter at full load with an STF28-461 EMI filter.

FIGURE 5



Typical output impedance (Z) with input shorted. STF28-461 EMI filter.

FIGURE 6

STF28-461 EMI Input Filters

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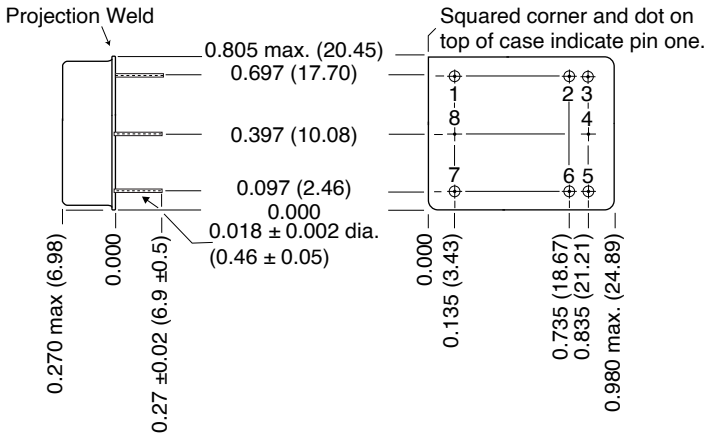
BOTTOM VIEW CASE A1



Weight: 12 grams typical

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
Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials

Header	Kovar/Nickel/Gold
Cover	Kovar/Nickel
Pins	Kovar/Nickel/Gold matched glass seal Gold plating of 50 - 225 microinches included in pin diameter Seal hole: 0.056 ±0.001 (1.42 ±0.03)

Please refer to the numerical dimensions for accuracy.

FIGURE 5: CASE A1

STF28-461 EMI Input Filters

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ELEMENT EVALUATION SPACE EMI FILTERS PROTOTYPE, CLASS H AND K

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

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

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

TABLE 6: ELEMENT EVALUATION SPACE EMI FILTERS PROTOTYPE, CLASS H AND CLASS K

STF28-461 EMI Input Filters

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Environmental Screening Space EMI Filters Prototype, Class H and K, RHA[1] H

Test Performed	Non-QML [2] Prototype [5] /OO [6]	QML [3, 4] Class H /HH [6]	QML [3, 4] Class K /KH [6]
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	■	■	■
PIND, Test Method 2020, Cond. A		■ [7]	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■	■
Burn-in Method 1015, +125°C case, typical [8]			
96 hours	■		
160 hours		■	
2 x 160 hours (includes mid-BI test)			■
Final Electrical Test, MIL-PRF-38534, Group A,			
Subgroups 1 and 4: +25°C case	■		
Subgroups 1 through 6, -55°C, +25°C, +125°C case		■	■
Hermeticity Test, Method 1014			
Gross Leak, Cond. B_2, Kr85			■
Gross Leak, Cond. C_1, fluorocarbon	■	■	
Fine Leak, Cond. B_1, Kr85			■
Fine Leak, Cond. A_2, helium	■	■	
Radiography, Method 2012			■
Post Radiography Electrical Test, +25°C case			■ [7]
Final visual inspection, Method 2009	■	■	■
Radiation tolerance [1, 9] Passive components, radiation tolerant		■	■

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

Notes
1. DLA has approved the RHA plan for Interpoint power products. Our SMD products with RHA "H" code meet DLA requirements.
2. Non-QML products, prototype (OO), may not meet all of the requirements of MIL-PRF-38534.
3. All processes are QML qualified and performed by certified operators.
4. Class H or K QML products that have no SMD number are marked "CHH, CKH" per MIL-STD-38534, Table III instead of "QML".
5. "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.
6. Our EMI filters are designed exclusively with passive components providing maximum tolerance for space environment requirements.
7. Not required by DLA but performed to assure product quality.
8. Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
9. Interpoint EMI filters are designed exclusively with passive components providing maximum tolerance for space environment requirements. RHA level H is guaranteed to 1000 krad(Si).

Table 7: Environmental Screening Space EMI Filters Prototype, Class H and Class K, RHA H