

STF28-461 EMI Input Filters

28 VOLT INPUT – 0.8 AMP

FEATURES

- Attenuation 55 dB at 500 kHz
- Small size, 0.79 in² (5.1 cm²)
- 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 μ F 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 μ F (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 μ sec. 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 μ Sec, 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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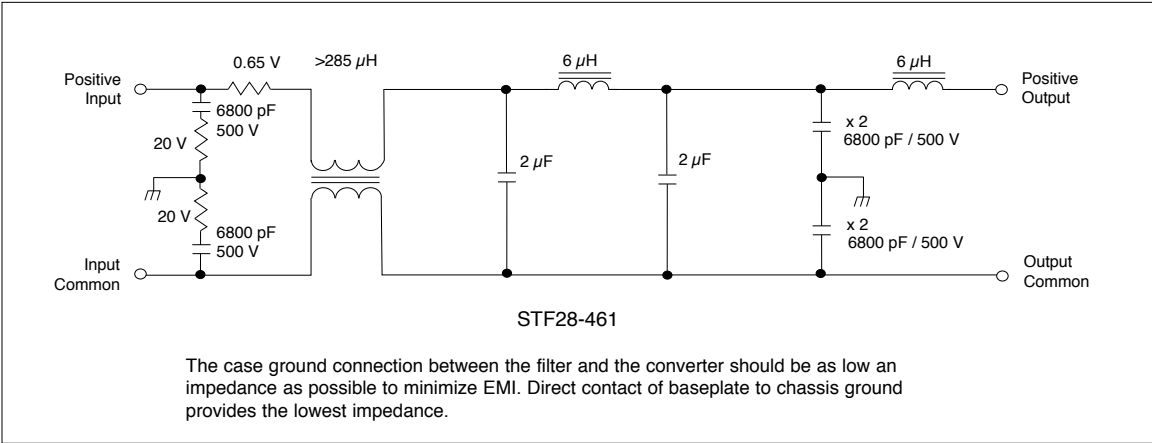


FIGURE 1: SCHEMATIC – TYPICAL VALUES

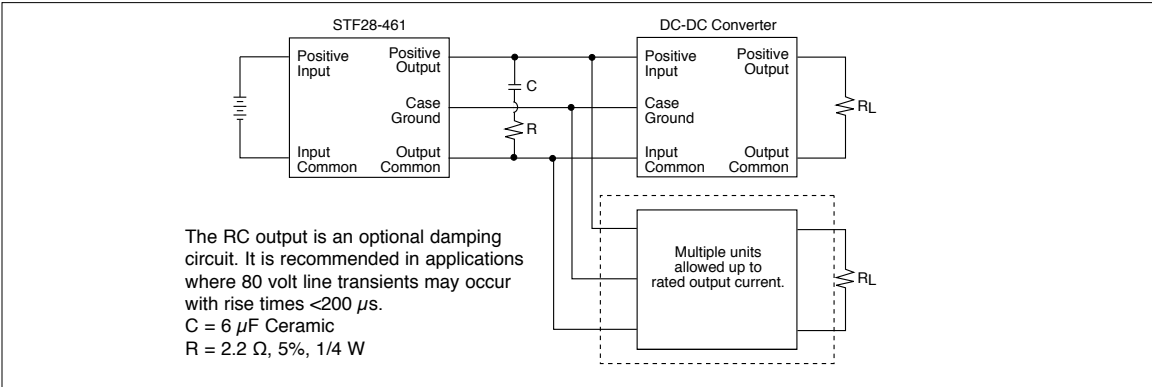
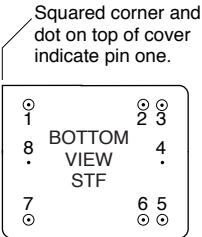


FIGURE 2: DAMPING CIRCUIT

| 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

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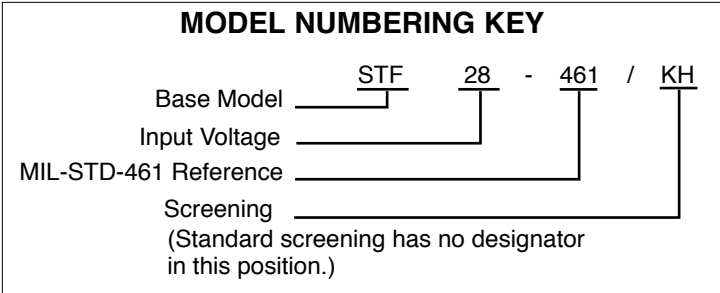


FIGURE 4: MODEL NUMBERING KEY

| 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 ¹ | | |
|--|------------------------------|---|
| TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW. | | |
| CATEGORY | Base Model and Input Voltage | Screening ⁴ |
| OPTIONS | STF28-461 | (standard, leave blank) ES H K |
| FILL IN FOR MODEL # ³ | STF28-461 | / _____ |

Notes

- See Figure 4, above, for an example of a model number.
- Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 6 on page 7 and Table 7 on page 8.
- If ordering by model number add a "-Q" to request solder dipped leads (STF28-461-Q). Available only for Class H or K.

TABLE 3: MODEL NUMBER OPTIONS

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

| MODEL | | FMCE-0528 | | | UNITS |
|--|-------------------------|-----------------------------------|-----|-------|---------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | |
| LEAD SOLDERING TEMPERATURE ¹ | 10 SECONDS MAX. | – | – | 300 | °C |
| STORAGE TEMPERATURE ¹ | | -65 | – | +150 | °C |
| CASE OPERATING TEMPERATURE ¹ | FULL POWER | -55 | – | +125 | °C |
| | ABSOLUTE | -55 | – | +135 | |
| DERATE I ₂ (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 EXCEPT CASE PIN | 500 VDC AT 25°C | 100 | – | – | Megohms |

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 | | | UNITS |
|--------------------------------|---------------------------------|--|-----|--------|-------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | |
| 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 EXCEPT CASE PIN | – | – | 45,000 | pF |
| OUTPUT VOLTAGE ¹ | STEADY STATE | V _{OUT} = V _{IN} - I _{IN} (RDC) | | | V |
| OUTPUT CURRENT ¹ | STEADY STATE | – | – | 0.80 | A |
| POWER DISSIPATION ¹ | T _C = 25°C | – | – | 1.15 | W |

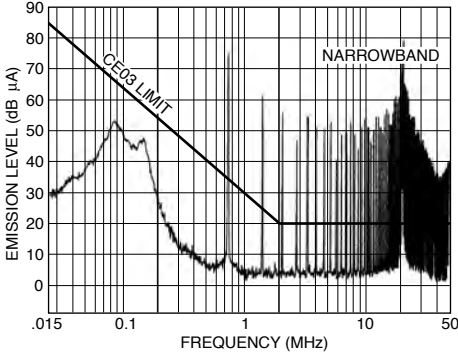
Notes

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

STF28-461 EMI Input Filters

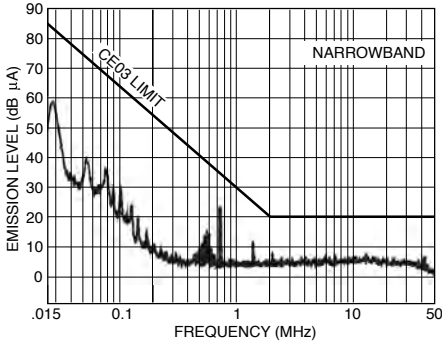
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TYPICAL PERFORMANCE PLOTS: 25°C CASE, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY. NOT GUARANTEED SPECIFICATIONS.



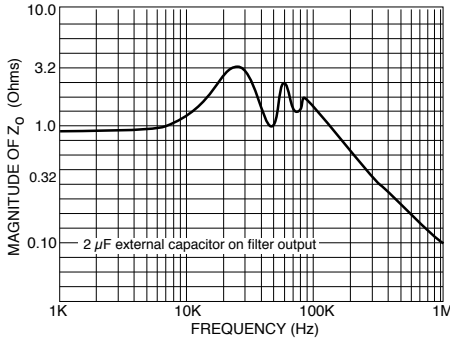
MSA2805S converter without a filter.

FIGURE 4



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

FIGURE 5



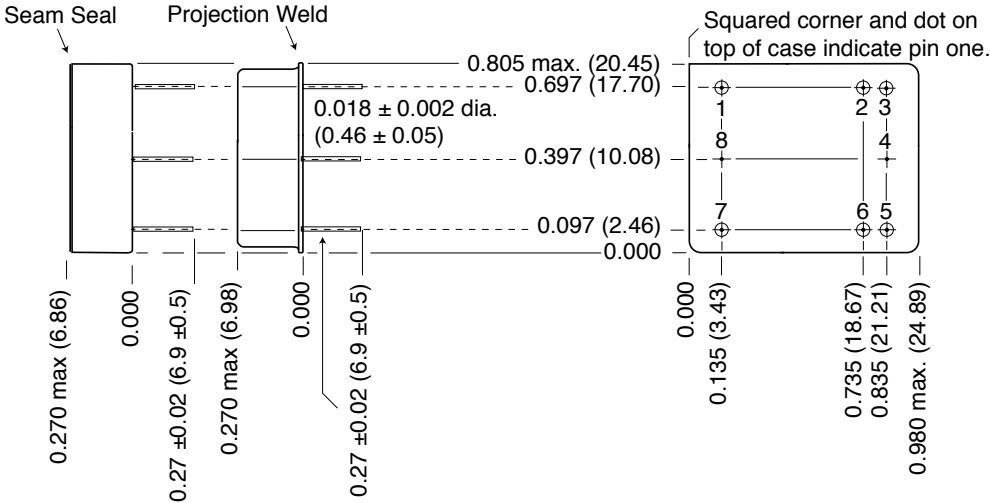
Typical output impedance (Z) with input shorted. STF28-461 EMI filter.

FIGURE 6

STF28-461 EMI Input Filters

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BOTTOM VIEW CASE A1



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

Materials
 Header Kovar/Nickel/Gold
 Cover Kovar/Nickel
 Pins Kovar/Nickel/Gold matched glass seal

Please refer to the numerical dimensions for accuracy.

FIGURE 5: CASE A1

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ELEMENT EVALUATION SPACE EMI FILTERS PROTOTYPE, CLASS H AND CLASS K

| COMPONENT-LEVEL TEST PERFORMED | NON-QML ¹ | QML | |
|--------------------------------|----------------------|----------------------|----------------------|
| | PROTOTYPE | CLASS H | CLASS K |
| | /O | /H P ² | /K 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

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ENVIRONMENTAL SCREENING SPACE EMI FILTERS PROTOTYPE, CLASS H AND CLASS K, MIL-PRF-38534 AND RHA¹ H

| TEST PERFORMED | NON-QML ² | QML ^{3, 4} | |
|---|------------------------|---------------------|------------------|
| | PROTOTYPE ⁵ | CLASS H | CLASS K |
| | /OO ⁶ | /HH ⁶ | /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, typical⁸ | | | |
| 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 hardened^{1, 9} | | | |
| Passive components, radiation hardened by design | | ■ | ■ |

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

Notes

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