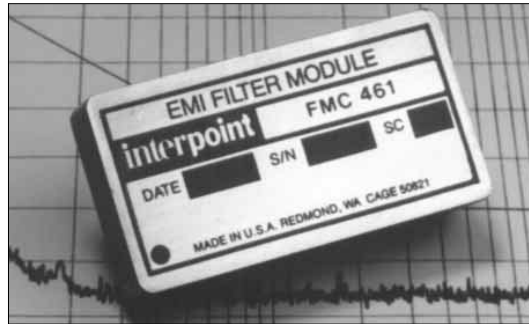


## FEATURES

- **-55°C to +125°C operation**
- Up to 50 dB attenuation  
400 kHz to 50 MHz
- Transient suppression
- Compliant to  
MIL-STD-461C, CE03
- Compatible with  
MIL-STD-704E  
DC power bus

# EMI INPUT FILTER 28 VOLT INPUT



Size (max): Non-flanged, case H1  
2.125 x 1.125 x 0.400 (53.98 x 28.58 x 10.16 mm)  
Flanged, case K2  
2.910 x 1.125 x 0.400 inches (73.91 x 28.58 x 10.16 mm)  
See Section B8, cases H1 and K2, for dimensions.

Weight: 48 grams maximum

Screening: Standard, ES, or 883 (Class H). See Section C2 for screening options, see Section A5 for ordering information.

## FMC EMI FILTER 2.7 AMP

MODEL	
FMC-461	2.7 Amp
FMC-461NT	2.7 Amp

## DESCRIPTION

The FMC-461™ EMI filter has been specifically designed to reduce the input line reflected ripple current of Interpoint's MHF, MTR, MTO, MHV, MHF+, MHD, MTW, MHE, and MLP series of DC/DC converters. It is intended for use in applications which have high frequency switch-mode DC/DC converters and which must meet MIL-STD-461C levels of conducted and radiated noise.

The FMC filter is built using thick-film hybrid technology and is hermetically sealed in metal packages for military, aerospace, and other high-reliability applications. The filter uses only ceramic capacitors for reliable high temperature operation.

### MIL-STD NOISE MANAGEMENT

When used in conjunction with Interpoint converters, the FMC-461 filter reduces input ripple current by 40 dB within the frequency band of 200 kHz to 50 MHz. This gives the filter/converter combination a performance which exceeds the CE03 test of MIL-STD-461C. Typical FMC-461 filter frequency response and output impedance behavior are shown in Figures 4 and 5. CE03 performance of a typical converter with the FMC-461 filter connected is shown in Figure 3.

### TRANSIENT SUPPRESSION

The FMC-461 filter also features a fast-reacting (1 pico second) transient suppressor which begins clamping the input voltage at approximately 47 VDC, protecting the DC/DC converter from damage from induced line transients.

### OPERATING TEMPERATURE

The filter is rated to operate with no degradation of performance over the temperature range of -55°C to +125°C (as measured at the baseplate). Above +125°C, current must be derated as specified on the following page.

### INSERTION LOSS

The maximum DC insertion loss for the FMC-461 filter (at a load of 22 watts) represents a power loss of less than 2% at typical input voltage.

### LAYOUT REQUIREMENT

The case pin, and ideally the case, should be tied to the case of the converter through a low-inductance connection.

**CRANE**

**interpoint**

A CRANE CO. COMPANY

B3-13

# FMC EMI FILTER 2.7 AMP

# EMI INPUT FILTERS

ABSOLUTE MAXIMUM RATINGS	
<b>Input Voltage</b>	<ul style="list-style-type: none"> <li>0 to 40 VDC continuous</li> </ul>
<b>Lead Soldering Temperature (10 sec per lead)</b>	<ul style="list-style-type: none"> <li>300°C</li> </ul>
<b>Storage Temperature Range (Case)</b>	<ul style="list-style-type: none"> <li>-65°C to +150°C</li> </ul>

RECOMMENDED OPERATING CONDITIONS	
<b>Input Voltage Range</b>	<ul style="list-style-type: none"> <li>16 to 40 VDC continuous for 40 W load</li> </ul>
<b>Case Operating Temperature (Tc)</b>	<ul style="list-style-type: none"> <li>-55°C to +125°C full power</li> </ul>
<b>Derating</b>	<ul style="list-style-type: none"> <li>DC input and output current</li> <li>Derate linearly from 100% at 125°C to 0% at 135°C case</li> </ul>

TYPICAL CHARACTERISTICS	
<b>Capacitance</b>	<ul style="list-style-type: none"> <li>0.038 µF max, any pin to case</li> </ul>
<b>Isolation</b>	<ul style="list-style-type: none"> <li>100 megohm minimum at 500 V</li> <li>Any pin to case, except case pin</li> </ul>

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

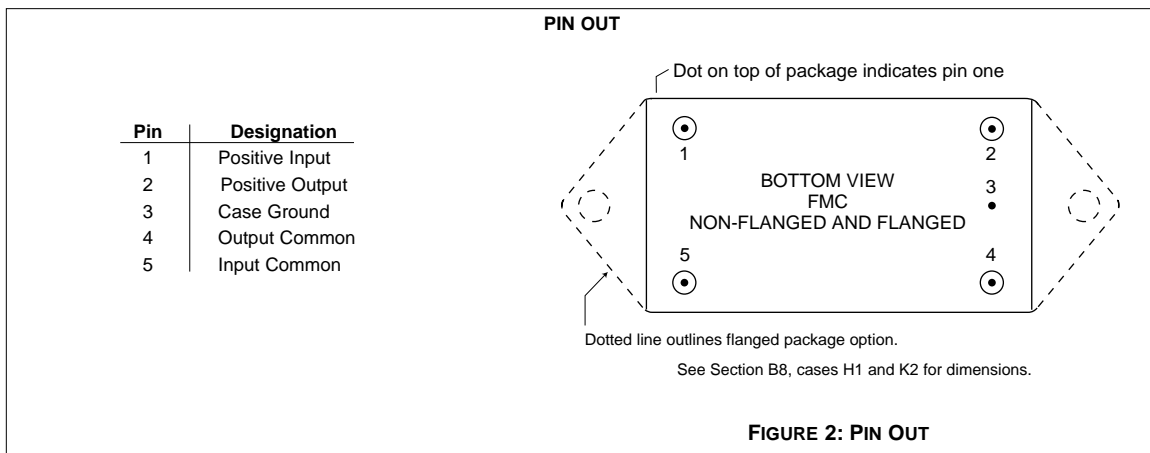
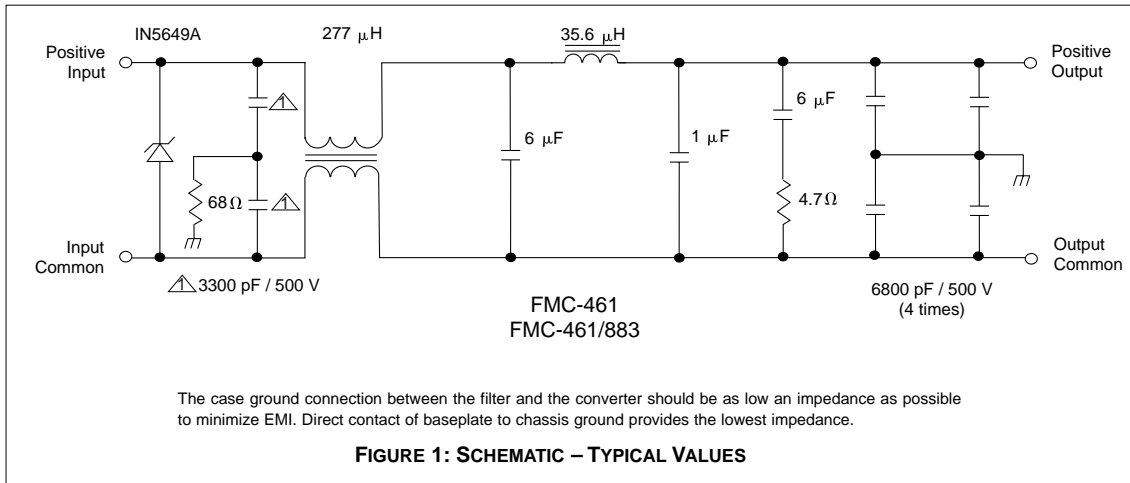
PARAMETER	CONDITIONS	FMC-461			FMC-461NT <sup>1</sup>			UNITS	
		MIN	TYP	MAX	MIN	TYP	MAX		
INPUT VOLTAGE	CONTINUOUS	0	28	40	0	28	40	VDC	
INPUT CLAMPING VOLTAGE		-55°C	40.8	45.1	49.4	—	—	—	VDC
		25°C	44.7	47.0	49.4	—	—	—	
		125°C	44.7	49.5	54.2	—	—	—	
INPUT CURRENT		—	—	2.7	—	—	2.7	A	
DIFFERENTIAL MODE NOISE REJECTION	200 kHz	40	—	—	40	—	—	dB	
	400 kHz - 50 MHz	50	—	—	50	—	—		
COMMON MODE NOISE REJECTION	2 MHz - 50 MHz	40	—	—	40	—	—	dB	
DC RESISTANCE (R <sub>DC</sub> )	TC = 25°C	—	—	0.20	—	—	0.20	Ω	
OUTPUT VOLTAGE <sup>2</sup>	STEADY STATE	$V_{OUT} = V_{IN} - I_{IN} (R_{DC})$			$V_{OUT} = V_{IN} - I_{IN} (R_{DC})$			VDC	
OUTPUT CURRENT	RIPPLE	—	—	1.0	—	—	1.0	A rms	
	STEADY STATE	—	—	2.7	—	—	2.7	A	
INTERNAL POWER DISSIPATION	MAXIMUM CURRENT	—	—	1.6	—	—	1.6	W	

#### Notes

- The FMC-461NT does not have a transorb and does not clamp the input voltage
- Typical applications result in Vout within 2% of Vin.

# EMI INPUT FILTERS

# FMC EMI FILTER 2.7 AMP

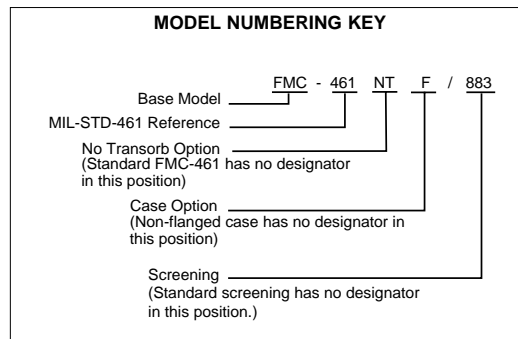


DSCC NUMBER	
DSCC DRAWING (5915)	FMC-461 FILTER SIMILAR PART
94010-01HXC	FMC-461/883
94010-01HZC	FMC-461F/883
94010-02HXC <sup>1</sup>	FMC-461NT/883 <sup>1</sup>
94010-02HZC <sup>1</sup>	FMC-461NTF/883 <sup>1</sup>

1. No transorb (NT)

Flanged SMDs have the suffix HZC instead of HXC.

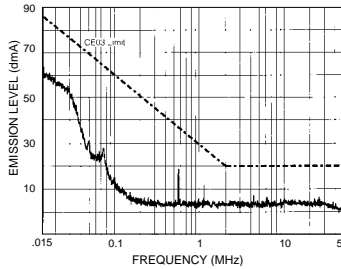
For exact specifications for a DSCC product, refer to the DSCC drawing. See Section A3, "SMD/DSCC Lists", for more information.



**FMC EMI FILTER  
2.7 AMP**

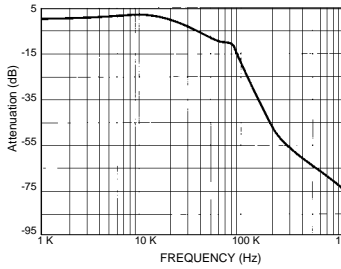
**EMI INPUT FILTERS**

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



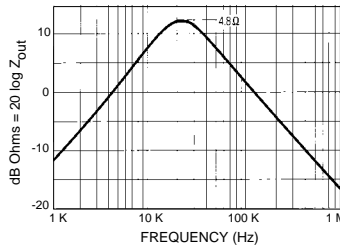
DC/DC Converter Typical Worst Case EMI With FMC-461 Filter

**FIGURE 3**



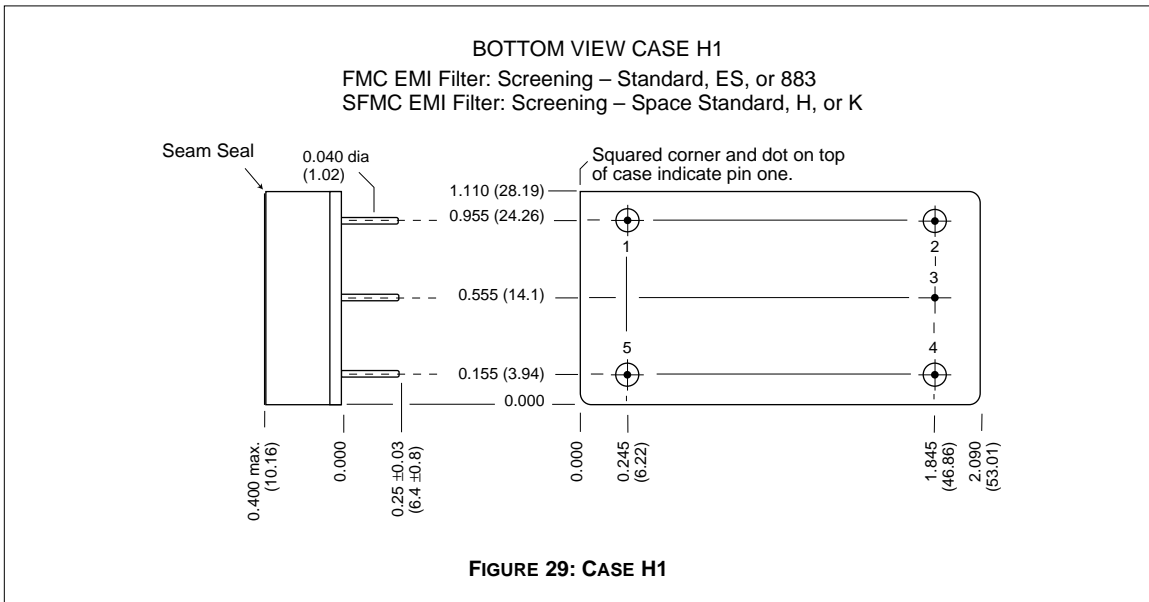
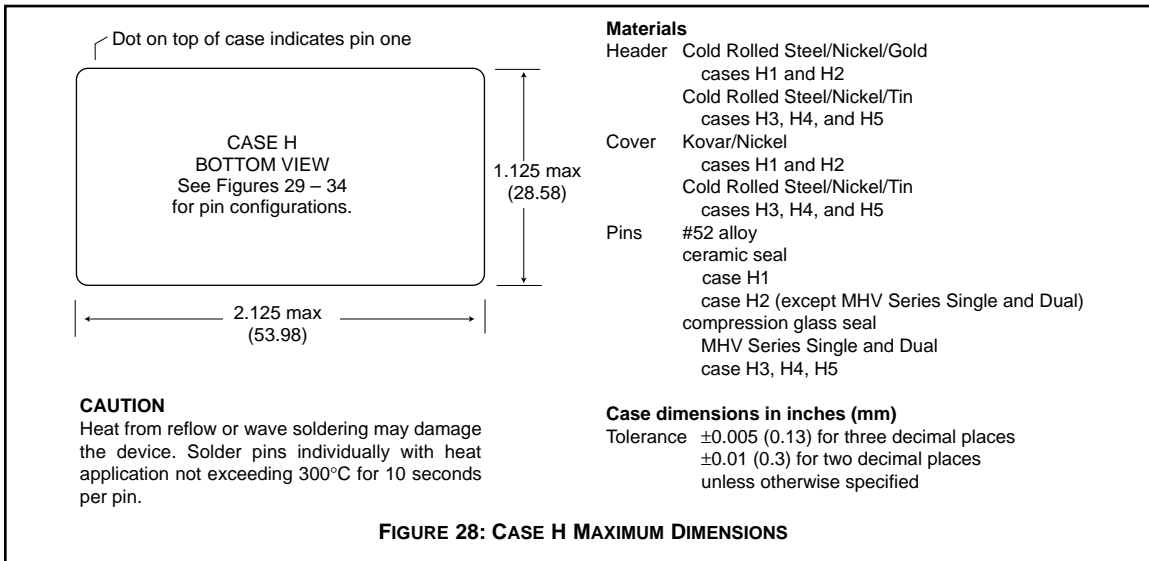
FMC-461 Typical Amplitude Response vs. Frequency

**FIGURE 4**



Typical Output Impedance (Z) With Input Shorted

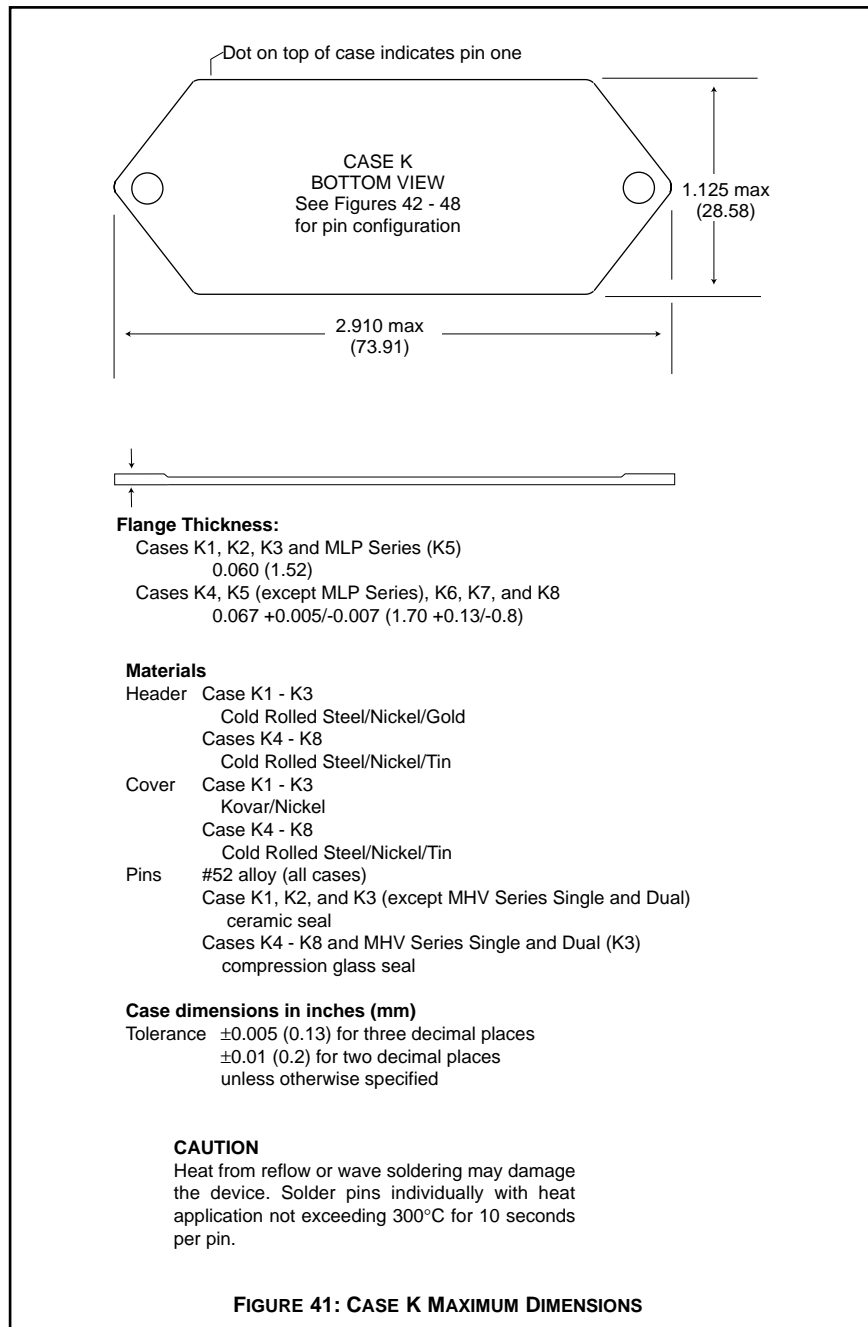
**FIGURE 5**

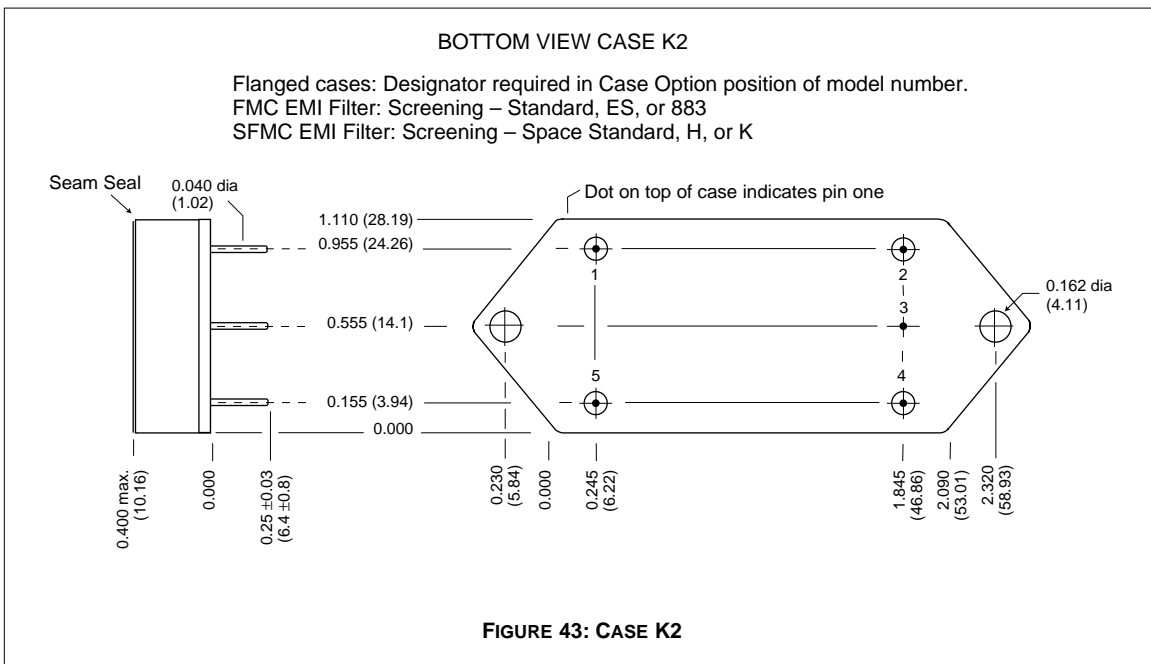
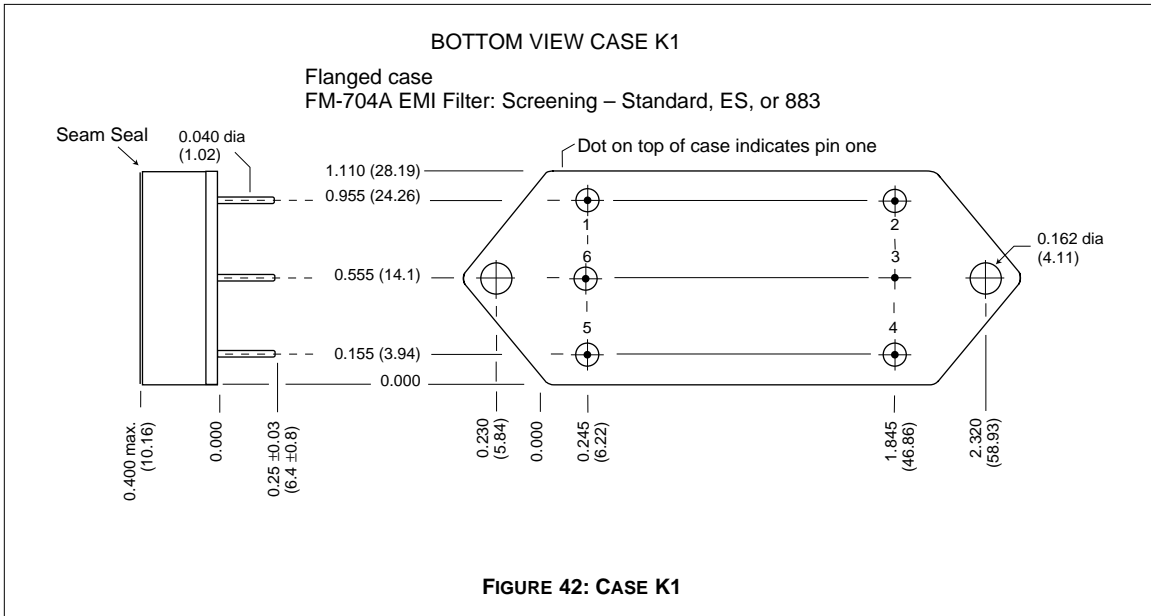


Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

# CASE K

# CASES





**QA SCREENING  
125°C PRODUCTS**

**125°C PRODUCTS**

<b>TEST (125°C Products)</b>	<b>STANDARD</b>	<b>/ES</b>	<b>/883 (Class H)*</b>
PRE-CAP INSPECTION Method 2017, 2032	yes	yes	yes
TEMPERATURE CYCLE (10 times) Method 1010, Cond. C, -65°C to 150°C Method 1010, Cond. B, -55°C to 125°C	no no	no yes	yes no
CONSTANT ACCELERATION Method 2001, 3000 g Method 2001, 500 g	no no	no yes	yes no
BURN-IN Method 1015, 160 hours at 125°C 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 Subgroups 1 and 4: +25°C case	no yes	no yes	yes no
HERMETICITY TESTING 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.

\*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.