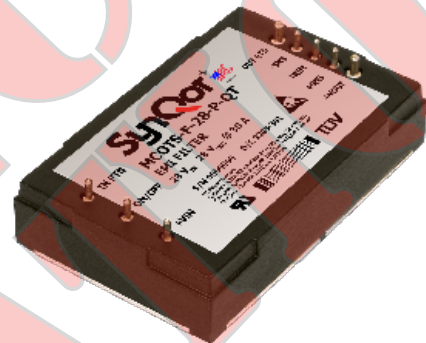


MILITARY COTS EMI FILTER

-40 to +40V Input	30A Output Current	20mΩ @ 100°C Max DC Resistance	>80dB @ 250kHz Differential Attenuation
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The Mil-COTS series of EMI filters brings SynQor's field proven technology and manufacturing expertise to the industrial power applications marketplace. SynQor's innovative packaging approach ensures survivability in the most hostile environments. Compatible with the industry standard format, these filters have high differential-mode and common-mode attenuation, low DC resistance, and a stabilizing bulk capacitor resistor. They follow conservative component derating guidelines and they are designed and manufactured to the highest standards.

Mil-COTS



Designed and Manufactured in the USA

Operational Features

- 30A output current
- Very low DC resistance
- > 80 dB differential-mode resistance at 250kHz
- > 36 dB common-mode resistance at 250kHz
- Stabilizing bulk capacitor and damping resistor included
- All capacitors are X7R multi-layer ceramic

Mechanical Features

- Size: 1.54" x 2.39" x 0.50" (39.0 x 60.6 x 12.7mm)
- Total weight: 3 oz (85 g)

Safety Features

- 2250 V, 30 MΩ input-to-output isolation
- Certified 60950-1 requirements for basic insulation (see Standards and Qualifications page)
- CE Marked
- RoHS compliant

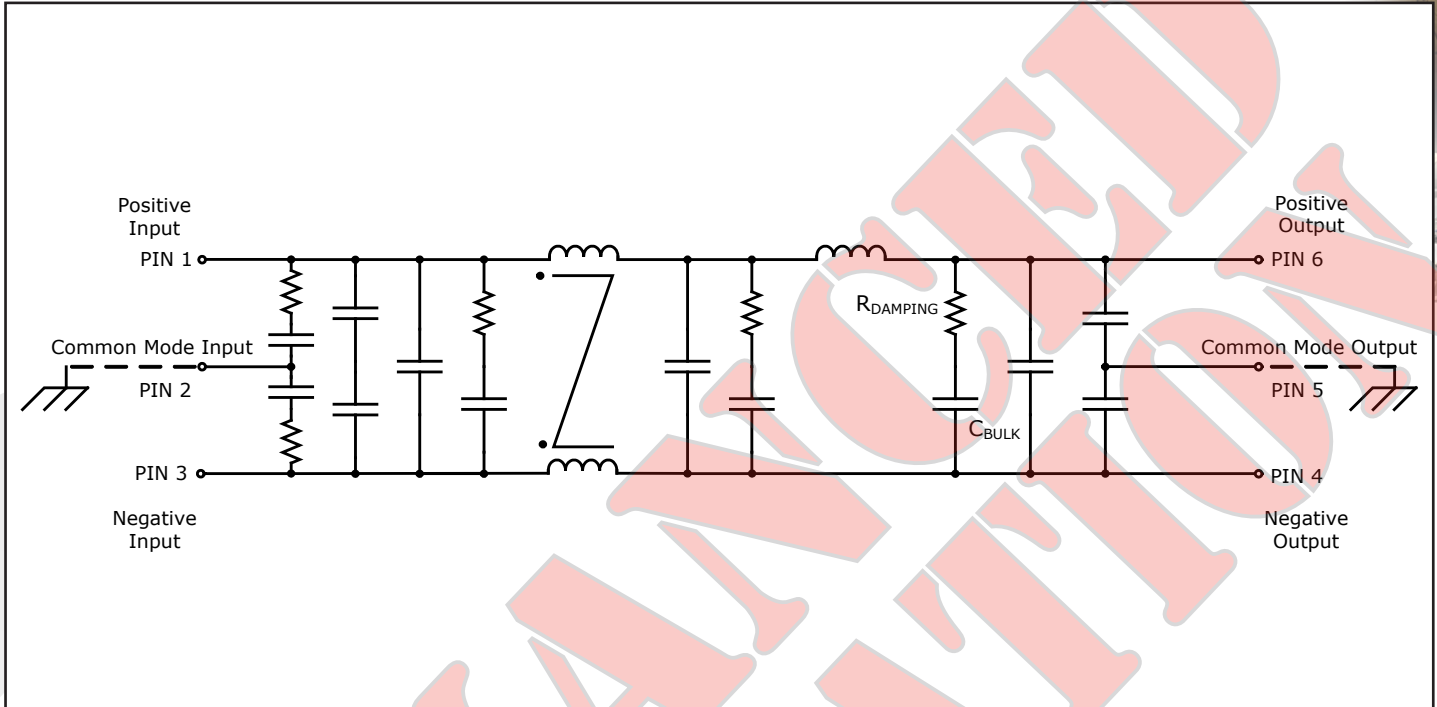
In-Line Manufacturing Process

- AS9100 and ISO 9110:2000 certified facility
- Full component traceability

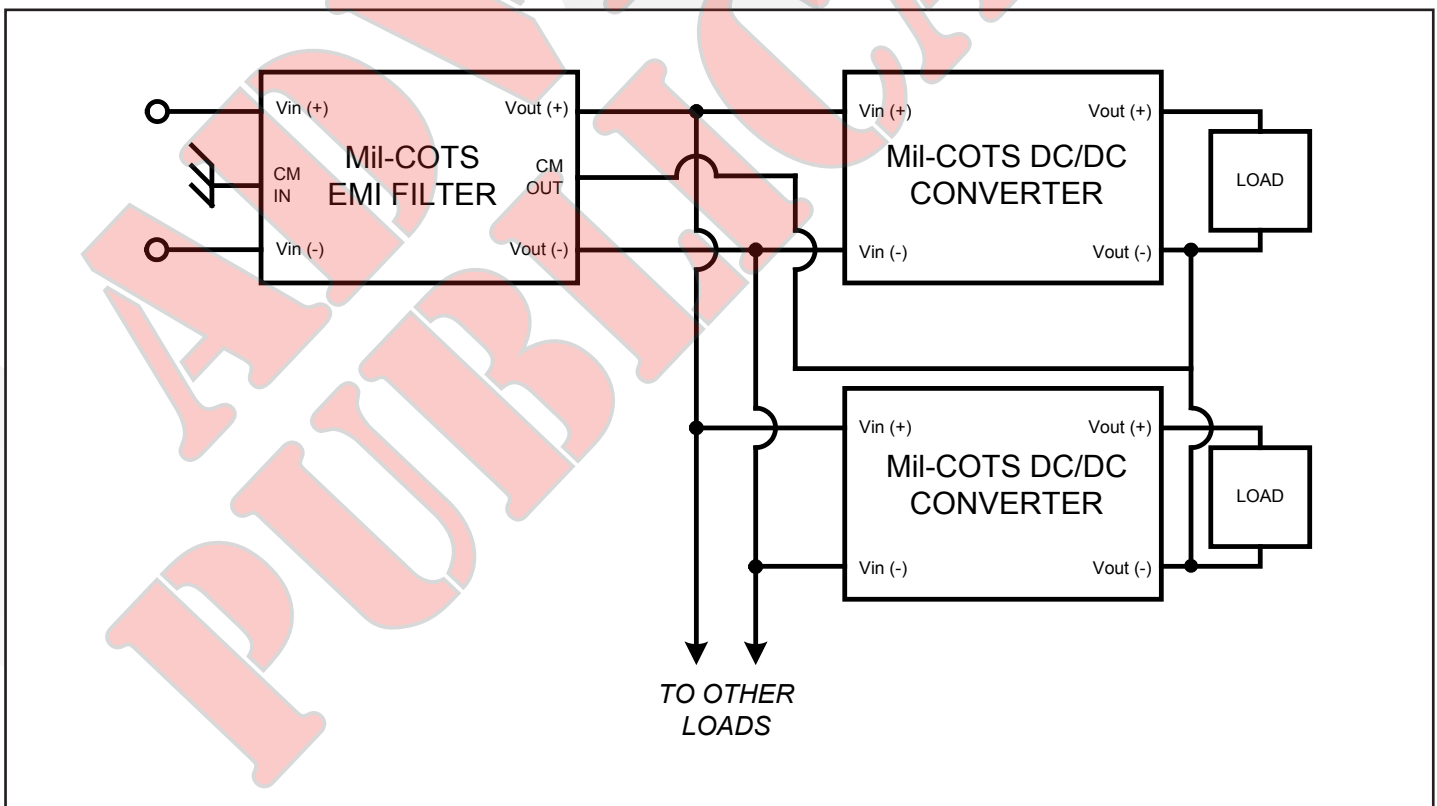
Screening/Qualification

- AS9100 and ISO 9100:2000 certified facility
- Qualification consistent with MIL-STD-883
- Available with standard or military grade screening
- Pre-cap inspection per IPC-610, Class III
- Temperature cycling per MIL-STD-883, Method 1010, Condition B, 10 cycles
- Burn-In at 100°C baseplate temperature
- Final visual inspection per MIL-STD-2008
- Full component traceability

Fundamental Circuit Diagram



Typical Connection Diagram



MCOTS-F-28-P-QT Electrical Characteristics

|Vin| <= 28V, |Iout| <= 30 A unless otherwise specified

Parameter	Min.	Typ.	Max.	Units	Notes & Conditions
ABSOLUTE MAXIMUM RATINGS					
Input Voltage					
Continuous	-40		+40	V	
Transient (≤ 1 s)	-50		50	V	
Isolation Voltage	-2250		2250	V dc	Input/output to common-mode pins
Output Current			35	A	
Operating Case Temperature	-55		100	°C	Baseplate temperature
Storage Case Temperature	-65		135	°C	
Lead Temperature (20 s)			300	°C	
RECOMMENDED OPERATING CONDITIONS					
Input Voltage					
Continuous	-40		+40	V	
Transient (≤ 1 s., Rs* = 0Ω)	-50		50	V	* Rs = Source Impedance
Output Current (continuous)	-30		30	A	
ELECTRICAL CHARACTERISTICS					
Output Voltage (continuous)	$V_{out} = V_{in} - (I_{in} \times R_{dc})$			V	
DC Resistance Rdc					total
Tcase = 25°C			15	mΩ	
Tcase = 100°C			20	mΩ	
Power Dissipation					30A output current
Tcase = 25°C			13.5	W	
Tcase = 100°C			18	W	
Total Differential-Mode Capacitance		220		μF	Measured across input or output pins
Total Common-Mode Capacitance		0.15		μF	Measured between any pin and common-mode pins
Bulk Capacitor		180		μF	
Damping Resistor		0.1		Ω	
Noise Attenuation	TBD				
Isolation Resistance	100			mΩ	Any pin to common-mode pins
RELIABILITY CHARACTERISTICS					
Calculated MTBF (Telcordia) TR-NWT-000332		TBD		10 ⁶ Hrs.	80% load, 200LFM, 40 °C Ta
Calculated MTBF (MIL-217) MIL-HDBK-217F		TBD		10 ⁶ Hrs.	80% load, 200LFM, 40 °C Ta
Field Demonstrated MTBF		TBD		10 ⁶ Hrs.	See our website for details
WEIGHT CHARACTERISTICS					
Device Weight		100		g	

MCOTS-F-28-P-QT Standards & Qualification Testing

STANDARDS COMPLIANCE

Parameter	Notes & Conditions
STANDARDS COMPLIANCE	PENDING
UL/cUL 60950-1	File # E194341, Basic insulation
EN60950-1	Certified by TUV
Needle Flame Test (IEC 695-2-2)	Test on entire assembly; board & plastic components UL94V-0 compliant
IEC 61000-4-2	ESD test, 8 kV - NP, 15 kV air - NP (Normal Performance)

Note: An external 35A input fuse must always be used to meet these safety requirements. Contact SynQor for official safety certificates on new releases or download from the SynQor website.

QUALIFICATION TESTING

Parameter	# Units	Test Conditions
QUALIFICATION TESTING		
Life Test	32	95% rated Vin and load, units at derating point, 1000 hours
Vibration	5	10-55 Hz sweep, 0.060" total excursion, 1 min./sweep, 120 sweeps for 3 axis
Mechanical Shock	5	100g minimum, 2 drops in x and y axis, 1 drop in z axis
Temperature Cycling	10	-40 °C to 100 °C, unit temp. ramp 15 °C/min., 500 cycles
Power/Thermal Cycling	5	Toperating = min to max, Vin = min to max, full load, 100 cycles
Design Marginality	5	Tmin-10 °C to Tmax+10 °C, 5 °C steps, Vin = min to max, 0-105% load
Humidity	5	85 °C, 85% RH, 1000 hours, continuous Vin applied except 5 min/day
Solderability	15 pins	MIL-STD-883, method 2003

Basic Operation and Features

This module is a multi-stage differential-mode and common-mode passive EMI filter designed to interface a power source with one or more Mil-COTS dc-dc converters (or other loads that create EMI). Each stage of this filter is well damped to avoid resonances and oscillations, and only X7R multi-layer ceramic capacitors are used. This Mil-COTS EMI filter includes a large bulk capacitor with a series damping resistor to correct for the unstabilizing effect of a converter's negative input resistance. A white paper discussing this negative input resistance and the need for corrective damping can be found on the SynQor website (see Input System Instability application note).

A typical application would place the Mil-COTS filter close to the input of the dc-dc converter. The Input common-mode pin would be connected to the chassis ground that is common with the system input line filter or other earthed point used for EMI measurement. The output common-mode pin would be connected to the output ground or plane of the power converters with as low inductance a path as possible. There are no connections to the metal baseplate, which may also be connected to the chassis ground if desired.

Do not connect the outputs of multiple Mil-COTS filters in parallel. Connecting filters in this manner may result in slightly unequal currents to flow in the positive and return paths of each filter. These unequal currents may cause the internal common-mode chokes to saturate and thus cause degraded common-mode rejection performance.

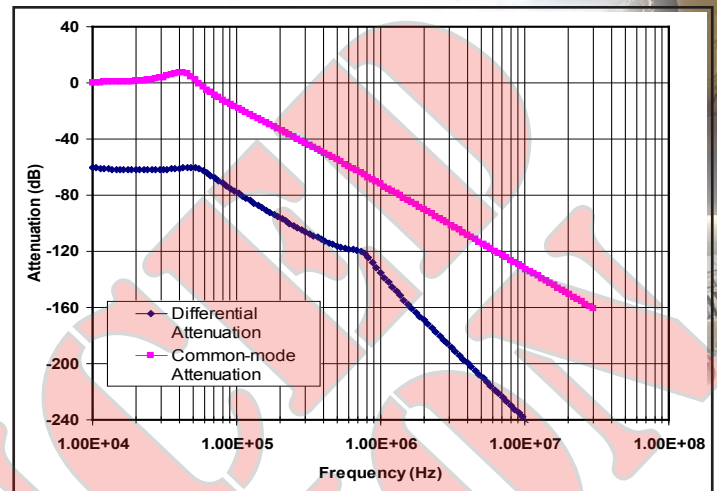
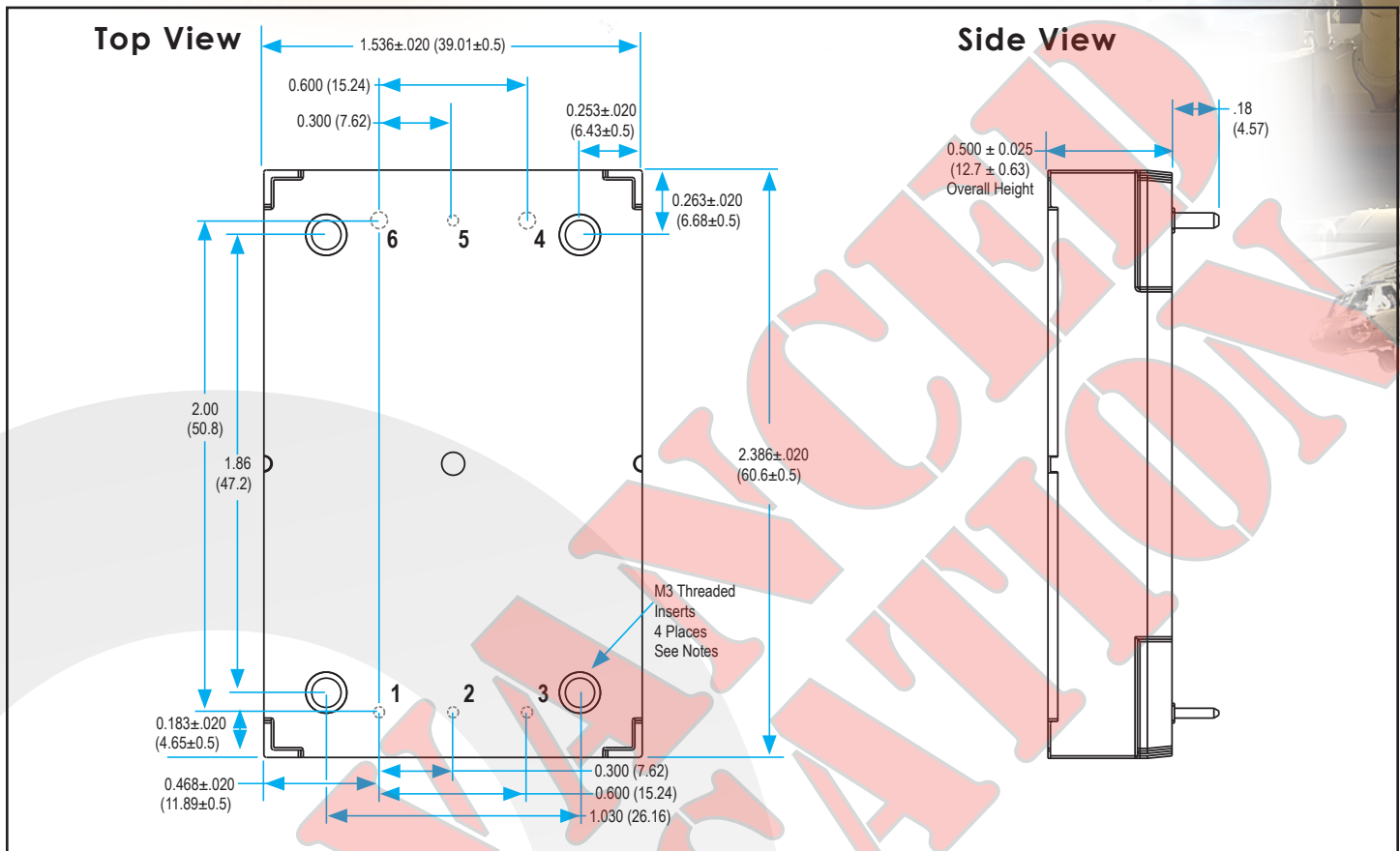


Figure 1: Typical Common Mode and Differential Mode Attenuation provided by the filter as a function of frequency. both input lines are connected to chassis ground through 50Ω resistors.



NOTES

- 1) Pins 1-3 & 5 are 0.040" (1.02 mm) diameter with 0.080" (2.03 mm) diameter standoff shoulders.
- 2) Pins 4 & 6 are 0.062" (1.57 mm) diameter with 0.100" (2.54 mm) diameter standoff shoulders.
- 3) Recommended pin length is 0.03" (0.76 mm) greater than the PCB thickness.
- 4) All Pins: Material - Copper alloy
Finish - Matte tin over nickel plate
- 5) M3 screws used to bolt unit's baseplate to other surfaces such as heatsink must not exceed 0.100" (2.54mm) depth below the surface of the baseplate.
- 6) Applied torque per screw should not exceed 6in-lb. (0.7 Nm).
- 7) Baseplate flatness tolerance is 0.004" (.10 mm) TIR for surface.
- 8) All dimensions in inches (mm)
Tolerances: x.xx +/-0.02 in. (x.x +/-0.5 mm)
x.xxx +/-0.010 in. (x.xx +/-0.25 mm)
- 9) Weight: 3.53 oz (100 g) typical
- 10) Workmanship: Meets or exceeds current IPC-A-610 Class II

PIN DESIGNATIONS

Pin No.	Name	Function
1	Vin (+)	Positive input voltage
2	Com In	Common-mode input
3	Vin (-)	Negative input voltage
4	Vout (-)	Negative output voltage
5	Com Out	Common-mode output
6	Vout (+)	Positive output voltage

Ordering Information/ Part Numbering

Family	Product	Input Voltage	Output Voltage	Package	Heatsink Option	Screening Level
MCOTS	C: Converter F: Filter	28: 16-40V 48: 34-75V 270: 155-400V	1R2: 1.2V 15: 15V 1R5: 1.5V 24: 24V 1R8: 1.8V 28: 28V 2R5: 2.5V 40: 40V 3R3: 3.3V 48: 48V 05: 5V (filters) 07: 7V P: Passive 12: 12V T: Active	FT: Full Brick HP: Half Brick Peta HZ: Half Brick Zeta QT: Quarter Brick EG: Eighth Brick SM: Sixteenth Brick	N: Normal F: Flanged	S: Standard M: MIL Grade

Example MCOTS-F-28-P-QT-N-S

Application Notes

A variety of application notes and technical white papers can be downloaded in pdf format from our website.

RoHS Compliance: The EU led RoHS (Restriction of Hazardous Substances) Directive bans the use of Lead, Cadmium, Hexavalent Chromium, Mercury, Polybrominated Biphenyls (PBB), and Polybrominated Diphenyl Ether (PBDE) in Electrical and Electronic Equipment. This SynQor product is 6/6 RoHS compliant. For more information please refer to SynQor's RoHS addendum available at our [RoHS Compliance / Lead Free Initiative web page](#) or e-mail us at rohs@synqor.com.

PATENTS

SynQor holds the following patents, one or more of which might apply to this product:

5,999,417	6,222,742	6,545,890	6,577,109
6,594,159	6,731,520	6,894,468	6,896,526
6,927,987	7,050,309	7,072,190	7,085,146
7,119,524	7,269,034	7,272,021	7,272,023

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E-mail: power@synqor.com
Web: www.synqor.com
Address: 155 Swanson Road
 Boxborough, MA 01719
 USA

Warranty

SynQor offers a two (2) year limited warranty. Complete warranty information is listed on our website or is available upon request from SynQor.

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