

Military Isolated DC-DC Converters



MilCOTS™ Isolated Converters

Mil-COTS DC-DC Converters for Military/Aerospace Applications

The MilQor® series of Mil-COTS Isolated DC-DC converters brings SynQor's field proven high-efficiency synchronous rectifier technology to the Military/Aerospace industry. These "off-the-shelf" converters are compatible with the industry standard format, operate at a fixed frequency, and follow conservative component derating guidelines. MilQor products are designed and manufactured to comply with a wide range of military standards.

MCOTS Product Features

- High efficiency, up to 95% at full rated load current
- Fixed frequency switching provides predictable EMI
- No minimum load requirement
- Rugged design for harsh environments
- Full Feature option on some models
- Flanged baseplate available
- Industry standard pin-out configurations and standard footprints.
- Available: High-capacitance option for very large output capacitance and extreme transient applications
- -55°C to +100°C Operating Temperature

Compliance Features

Mil-COTS converters with Mil-COTS filters are designed to meet:

- MIL-HDBK-704
- RTCA/DO-160 Section 16, 17, 18
- MIL-STD-1275
- MIL-STD-461
- DEF-STAN 61-5 (part 6)/(5, 6)

Protection

- Input under-voltage lockout
- Output current limit and short circuit protection
- Active back bias limit
- Output over-voltage protection
- Thermal shutdown (not on DM Package Size)


Control

- On/Off control referenced to input side (Fully isolated Full Bricks)
- Remote sense for the output voltage
- Digital Output Current Sharing (HZ only)
- Output voltage trim range of:
 - (Half-Brick Zeta) +10% to -20%
 - (Quarter-Brick Exa) +10% to -50%
 - (Sixteenth Brick) +10% to -50%
 - +10% to -10%


For SynQor product information and sales

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9V 16V	MCOTS-28 Input Range: 16-40V Transient: 16-50V Max. Power: 510W Efficiency: Up to 95%	MCOTS-28E Input Range: 16-70V Transient: 16-100V Max. Power: 400W Efficiency: Up to 95%	MCOTS-28V Input Range: 9-40V Transient: 9-55V Max. Power: 250W Efficiency: Up to 91%	MCOTS-28VE Input Range: 9-70V Transient: 9-100V Max. Power: 250W Efficiency: Up to 92%	MCOTS-48 Input Range: 34-75V Transient: 34-100V Max. Power: 600W Efficiency: Up to 95%
55V					
100V					
155V	MCOTS-150 Input Range: 90-210V Transient: 90-250V Max. Power: 150W Efficiency: Up to 90%				
200V					
300V			MCOTS-270 Input Range: 155-425V Transient: 155-475V Max. Power: 600W Efficiency: Up to 91%	MCOTS-270H Input Range: 240-425V Transient: 240-475V Max. Power: 800W Efficiency: Up to 92%	MCOTS-270N Input Range: 240-280V Transient: 200-350V Max. Power: 400W Efficiency: Up to 89%
475V					



95% Efficiency



Mil-COTS DC-DC Converters

Family	Product	Cont. Input Voltage	Output Voltage		Package Size/ (Performance Level)	Heatsink Option	Screening Level	Options
MCOTS	C: Converter	28: 16-40V	1R2: 1.2V	12: 12V	FZ: Full Brick (Zeta) FE: Full Brick (Exa) FP: Full Brick (Peta) FT: Full Brick (Tera) HZ: Half Brick (Zeta) HP: Half Brick (Peta) HT: Half Brick (Tera) QE: Quarter Brick (Exa) QT: Quarter Brick (Tera) SM: Sixteenth Brick (Mega) DM: Demi Brick (Mega)	N: Encased, Baseplate D: Encased, Non-Threaded Baseplate F: Encased, Flanged Baseplate	S: S-Grade M: M-Grade	[]: Standard F: Full Feature C: High-Capacitance FC: High-Capacitance & Full Feature
		28E: 16-70V	1R5: 1.5V	15: 15V				
		28V: 9-40V	1R8: 1.8V	24: 24V				
		28VE: 9-70V	2R5: 2.5V	28: 28V				
		48: 34-75V	3R3: 3.3V	36: 36V				
		150: 90-210V	05: 5.0V	40: 40V				
		270: 155-425V	07: 7.0V	48: 48V				
		270H: 240-425V	7R5: 7.5V	50: 50V				
		270N: 240-280V	08: 8.0V	135: 135V				
			10: 10V	270: 270V				

Example: MCOTS-C-28-05-HP-N-M For valid part numbers, refer to the website or contact your local sales representative.

See "Encased Package Configurations" on page 93 for package outlines.

Military Isolated DC-DC Converters

Single Output

Dual Output

MCOTS-28 Demi	Vout	3.3V	5.0V	12V	15V	28V	±5.0V	±12V	±15V
	16-40Vin Cont. 50Vin 1s Trans. Absolute Max Vin = 60V	Demi Brick	15A 50W	10A 50W	4.0A 48W	3.3A 50W	1.8A 50W	10A 50W Total	4A 48W Total

MCOTS-28	Vout	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	7.5V	12V	15V	24V	28V	40V	48V	50V	135V	270V
	16-40Vin Cont. 50Vin 1s Trans. Absolute Max Vin = 60V	Full Brick Zeta																
1/2 Brick Zeta							60A 300W			42A 504W	34A 510W	21A 504W	18A 504W	12.5A 500W		10A 500W	3.7A 500W	
1/2 Brick Peta				60A 108W		50A 165W	40A 200W		27A 202W	16A 192W	13A 195W	8.33A 192W	7A 196W	5A 200W	4A 192W			
1/4 Brick Exa							40A 200W			25A 300W	20A 300W		10.7A 300W			6A 300W		
1/4 Brick Tera		40A 48W	40A 60W	40A 72W	40A 100W	30A 99W	24A 120W	17A 119W		10A 120W	8A 120W	5A 120W	4A 112W	3A 120W	2.5A 120W			
1/16 Brick Mega		25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W		4A 48W								

MCOTS-28E	Vout	5V	9.6V	12V	15V	24V	28V	40V	50V
	16-70Vin Cont. 100Vin 1s Trans. Absolute Max Vin = 100V	1/2 Brick Zeta	60A 300W	42A 403W	33A 396W	26A 390W	16A 384W	14A 392W	10A 400W

MCOTS-28E Demi	Vout	5V
	16-70Vin Cont. 100Vin 1s Trans. Absolute Max Vin = 100V	Demi Brick

MCOTS-28V	Vout	1.8V	3.3V	5V	7V	7.5V	12V	15V	24V	28V	40V	48V	50V	
	9-40Vin Cont. 55Vin 1s Trans. Absolute Max Vin = 60V	1/2 Brick Zeta			50A 250W			21A 252W	17A 255W	10A 240W	9A 252W	6A 240W		5A 250W
		1/2 Brick Peta	60A 108W		36A 180W		24A 180W	15A 180W	12A 180W	7.5A 180W	6.5A 182W	4.5A 180W	3.7A 178W	
1/4 Brick Tera		35A 63W	25A 83W	17A 85W	12A 84W		7A 84W	5.5A 83W	3.5A 84W	2.8A 78W		1.8A 86W		

MCOTS-28VE	Vout	1.8V	3.3V	5V	7V	7.5V	12V	15V	24V	28V	40V	48V	50V	
	9-70Vin Cont. 100Vin 1s Trans. Absolute Max Vin = 100V	1/2 Brick Zeta			50A 250W			21A 252W	17A 255W	10A 240W	9A 252W	6A 240W		5A 250W
		1/2 Brick Peta	55A 99W	45A 149W	32A 160W		22A 165W	13A 156W	11A 165W	6.7A 161W	5.8A 162W	4A 160W	3.4A 163W	
1/4 Brick Tera		35A 63W	25A 83W	17A 85W	12A 84W		7A 84W	5.5A 83W	3.5A 84W	2.8A 78W		1.8A 86W		

MCOTS-48	Vout	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V	50V	
	34-75Vin Cont. 100Vin 1s Trans. Absolute Max Vin = 100V	1/2 Brick Zeta						60A 300W		50A 600W	40A 600W	25A 600W	21.5A 602W		15A 600W		12A 600W
		1/2 Brick Peta	60A 72W	60A 90W	60A 108W	60A 150W	60A 198W	46A 230W	35A 245W	21A 252W	17A 255W	10.5A 252W	9A 252W		6.3A 252W	5.2A 250W	
		1/4 Brick Tera	40A 48W	40A 60W	40A 72W	40A 100W	30A 99W	25A 125W	20A 140W	12A 144W	10A 150W	6A 144W	5A 140W	5A 150W	3A 120W	3A 144W	
1/16 Brick Mega		25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W							

MCOTS-150	Vout	5V	28V	48V
	90-210Vin Cont. 250Vin 1s Trans. Absolute Max Vin = 250V	1/4 Brick Tera	30A 150W	5.35A 150W

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MCOTS-270	Vout	3.3V	5V	6V	12V	15V	24V	28V	48V
155-425Vin Cont. 475Vin 1s Trans. Absolute Max Vin = 600V	Full Brick Tera		80A 400W		50A 600W	40A 600W	25A 600W	21.4A 599W	12.5A 600W
	1/2 Brick Tera	60A 198W	50A 250W	33A 198W	25A 300W	20A 300W	12.5A 300W	10.7A 300W	6.3A 302W
	1/4 Brick Tera	30A 99W	30A 150W	25A 150W	13A 156W	10A 150W	6.25A 150W	5.35A 150W	3.1A 149W

MCOTS-270	Vout	40V (10-40V)	60V (25-60V)
155-425Vin Cont. 475Vin 1s Trans. Absolute Max Vin = 600V	Full Brick Exa	60A 1000W	40A 1000W
	1/2 Brick Exa	35A 600W	25A 600W

MCOTS-270H	Vout	5V	6V	7V	12V	28V	36V
240-425Vin Cont. 475Vin 1s Trans. Absolute Max Vin = 600V	Full Brick Peta	100A 500W	110A 660W	90A 630W	66.7A 800W	28.6A 800W	22.2A 800W

MCOTS-270N	Vout	8V	10V	12V	28V
240-280Vin Cont. 200-350Vin 100ms Trans. Absolute Max Vin = 600V	1/2 Brick Tera	50A 400W	40A 400W	33A 396W	14.5A 406W



Product Screening

SCREENING	Process Description	S-Grade	M-Grade
Baseplate Operating Temperature		-55°C to +100°C	-55°C to +100°C
Storage Temperature		-65°C to +135°C	-65°C to +135°C
Pre-Cap Inspection	IPC-A-610 Class III	•	•
Temperature Cycling	MIL-STD-883F, Method 1010, Condition B, 10 Cycles		•
Burn-In	100°C Baseplate	12 hours	96 hours
Final Electrical Test	100%	25°C	-55°C, +25°C, +100°C
Final Visual Inspection	MIL-STD-883, Method 2009	•	•

Product Qualification

QUALIFICATION Test Name	Details	# Tested (# Failed)	Consistent with MIL-STD-883F Method
Life Testing	Visual, mechanical and electrical test before, during and after 1000 hour burn-in @ full load	15 (0)	Method 1005.8
Shock-Vibration	Visual, mechanical and electrical test before, during and after shock and vibration tests	5 (0)	MIL-STD 202, Methods 201A and 213B
Humidity	+85°C, 95% RH, 1000 hours, 2 minutes on 6 hours off	8 (0)	Method 1004.7
Temperature Cycling	500 cycles of -55°C to +100°C (30 minute dwell at each temperature)	10 (0)	Method 1010.8, Condition A
Solderability	15 pins	15 (0)	Method 2003
DMT	-65°C to +110°C across full line, and load specifications in 5°C steps	7 (0)	—
Altitude	70,000 feet (21 km)	2 (0)	—

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MilCOTS™

DC Filters



Mil-COTS DC Filter Modules

SynQor provides EMI filters for the MIL-COTS DC-DC converters. All EMI filters provide high levels of differential-mode and common-mode attenuation and include stabilizing bulk capacitors and damping resistors.

Filter Features

- Low DC resistance
- Differential-mode attenuation
- Common-mode attenuation
- Bulk capacitance provides input system stabilization for downstream power converters
- -55°C to +100°C Operating Temperature
- No electrolytic capacitors (all ceramic design)
- High-voltage isolation between common-mode pins and input / output
- Wide temperature range operation
- Designed to meet MIL-STD-461

Mil-COTS DC Filters

Family	Product	Vin Range	Filter Type	Package Size	Thermal Design	Screening Level
MCOTS	F: Filter	28: -40V to +40V 28E: -70V to +70V 48: -80V to +80V 270: -500V to +500V	P: Passive T: Transient	DM: Demi-brick Mega QT: Quarter-brick Tera HT: Half-brick Tera	N: Encased, Threaded Baseplate D: Encased, Non-Threaded Baseplate F: Encased, Flanged Baseplate	S: S-Grade M: M-Grade

Example: MCOTS-F-28-T-HT-N-M For valid part numbers, refer to the website or contact your local sales representative.

DC Filter Model Number	Input Voltage		Output Current	Isolation Voltage (to common-mode)	Maximum DC Resistance @ 100°C	Differential-Mode Attenuation	Common-Mode Attenuation
	Continuous	Surge (<100ms)					
HALF BRICK							
MCOTS-F-28-T-HP	±40V	+100V, -50V	40A	2250V	40mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-28-T-HT	±40V	+100V, -50V	30A	2250V	40mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-270-P-HT	±500V	±630V	9.0A	2500V	106mΩ	>70dB @ 250kHz	>50dB @ 250kHz
QUARTER BRICK							
MCOTS-F-28-P-QT	±40V	±50V	30A	2250V	20mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-48-P-QT	±80V	±100V	20A	2250V	32mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-270-P-QT	±500V	±630V	4.0A	2500V	180mΩ	>80dB @ 500kHz	>50dB @ 500kHz
DEMI BRICK							
MCOTS-F-28-P-DM	±40V	±50V	10A	1000V	60mΩ	>80dB @ 500kHz	>60dB @ 500kHz
MCOTS-F-28E-P-DM	±70V	±100V	10A	1000V	60mΩ	>80dB @ 500kHz	>60dB @ 500kHz

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MilCOTS™ AC Filters



Mil-COTS AC Line Filter Modules

SynQor provides AC Line filters for the Mil-COTS series of PFC modules and DC-DC converters. SynQor's high-performance filters are designed to comply with military EMI requirements.

Filter Features

- Universal Input voltage range
- 500W@115Vrms or 1kW@230Vrms (Eighth-Brick)
- 1kW@115V or 2kW@230V (Half-Brick)
- All ceramic capacitor design
- High voltage isolation between baseplate and input/output
- Internally damped
- -55°C to +100°C Operating Temperature
- Low power dissipation
- Complies with industry EMI standards when used with SynQor MPFC and DC-DC converter modules

Mil-COTS AC Line Filters

Family	Input Frequency	Vin Range	Package Size	Thermal Design	Screening Level
MACF	U: 50/60Hz & 400Hz 060: 50/60Hz 400: 400Hz	230: 85-264Vrms	ET: Eighth-brick Tera HT: Half-brick Tera	N: Encased, Threaded Baseplate D: Encased, Non-Threaded Baseplate F: Encased, Flanged Baseplate	S: S-Grade M: M-Grade

Example: MACF-060-230-HT-N-M For valid part numbers, refer to the website or contact your local sales representative.

Model Number	Input Phase	Input Frequency	Input Voltage	Output Current	Output Power
MACF-U-230-ET	Single Phase	50/60Hz & 400Hz	85-264VRMS	4.5ARMS	500W@115VRMS/1kW@230VRMS
MACF-060-230-HT	Single Phase	50/60Hz	85-264VRMS	9ARMS	1kW@115VRMS/2kW@230VRMS
MACF-400-230-HT	Single Phase	400Hz	85-264VRMS	9ARMS	1kW@115VRMS/2kW@230VRMS

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Mil-COTS Power Factor Correction Module

The MPFCQor Power Factor Correction module is an essential building block of an AC-DC power supply. Used in conjunction with a hold-up capacitor, SynQor’s high efficiency MCOTS DC-DC converters and SynQor’s MCOTS AC line filter, the MPFCQor will draw a nearly perfect sinusoidal current (PF>0.99) from a single phase AC input. The MPFCQor module can be paralleled to achieve higher power. The module is supplied completely encased to provide protection from the harsh conditions seen in many military and extreme environments.

Operational Features

- Universal input voltage range: 85-264Vrms
- Narrow input voltage range: 85-180Vrms
- Universal input frequency range: 47 - 63Hz / 360 - 800Hz
- Up to 700W output power
- ≥0.99 Power Factor
- High efficiency: Up to 95% (115Vrms)
- Internal inrush current limit
- Auxiliary 10V bias supply
- 100°C max baseplate temperature at full power
- -55°C to +100°C Operating Temperature
- Can be paralleled with current sharing
- Compatible with SynQor’s MCOTS DC-DC Converters and SynQor’s MCOTS AC line filters

Protection/Control Features

- PFC Enable
- Load Enable (also: Power Out Good signal)
- AC Power Good Signal (Half-Brick Only)
- Clock synchronization (Half-Brick Only)
- Output current monitor/current sharing (Half-Brick Only)
- Input current limit and auto-recovery short circuit protection
- Auto-recovery input under/over-voltage protection
- Auto-recovery output over-voltage protection
- Auto-recovery thermal shutdown

Mil-COTS Power Factor Correction Module

Family	Vin Range	Output Voltage	Package Size	Thermal Design	Screening Level
MPFC	U: 85-264Vrms 115: 85-180Vrms	270: 270Vdc 390: 390Vdc	QP: Quarter-brick Peta HP: Half-brick Peta	N: Encased, Threaded Baseplate D: Encased, Non-threaded Baseplate F: Encased, Flanged Baseplate	S: S-Grade M: M-Grade

Example: MPFC-U-390-HP-N-M For valid part numbers, refer to the website or contact your local sales representative.

Model Number	Input Voltage	Output Voltage	Output Power
MPFC-U-390-HP	85-264 Vrms	390 Vdc	700 W
MPFC-115-270-HP	85-180 Vrms	270 Vdc	700 W
MPFC-U-390-QP	85-264 Vrms	390 Vdc	350 W
MPFC-115-270-QP	85-180 Vrms	270 Vdc	350 W

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