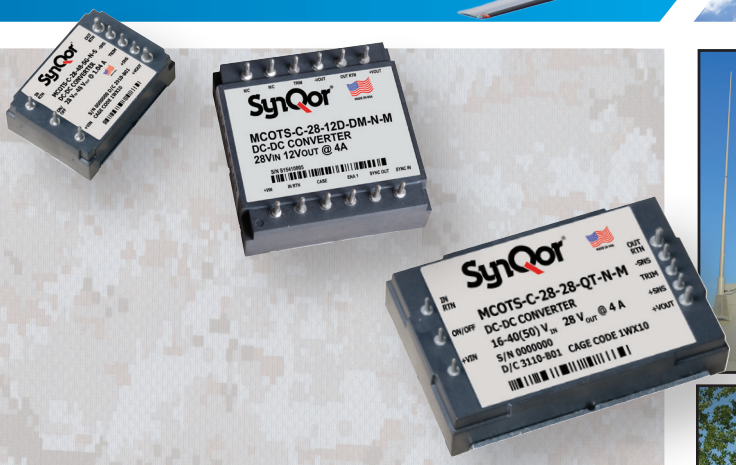
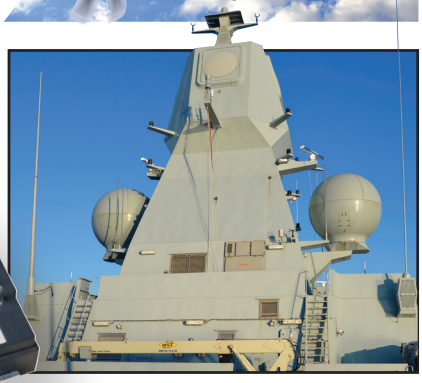
SynQor®

MilCOTS™

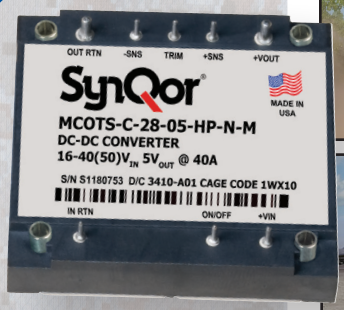
MIL-STD Compliant
High Efficiency
Field Proven

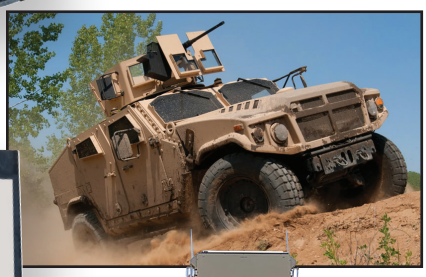
DC to DC

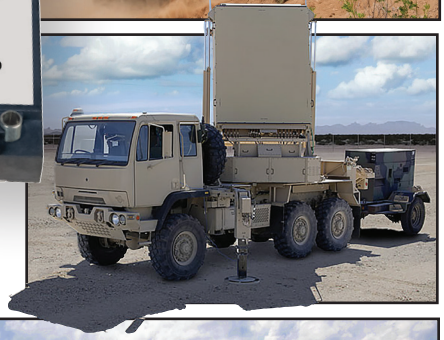


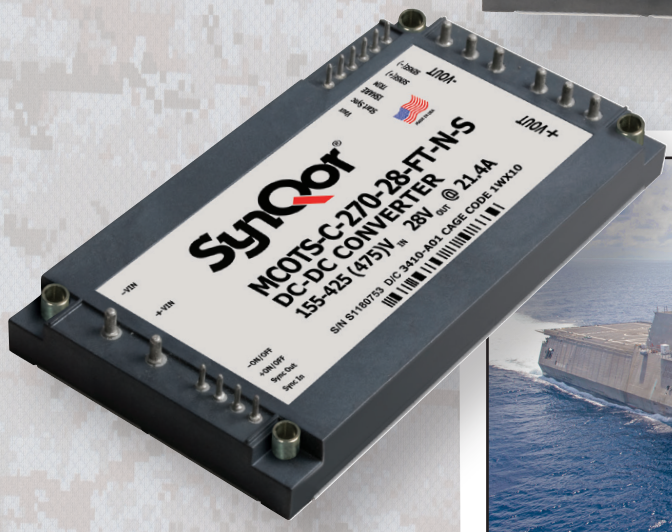


Military "Off-The-Shelf" DC Power Converters & Filters









Made in USA

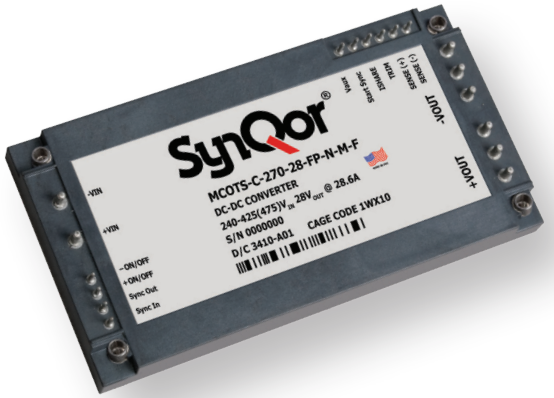
MilQor®

Products for the
Military and Aerospace Industry

MilCOTS™

Isolated Converters

DC to DC



"Off-the-shelf" DC-DC Converters for Cost Sensitive Military/Avionics Applications

The MilQor® series of Mil-COTS Isolated DC-DC converters brings SynQor's field proven high-efficiency synchronous rectifier technology to the Military/Avionics 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

MilCOTS converters with MilCOTS 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 (ON/OFF control islolated in Full Bricks)
- Remote sense for the output voltage
- Digital Output Current Sharing (HZ & HY only)
- Output voltage trim range of: +10% to -20%
  (Half-Brick Zeta/Yota) +10% to -50%
  (Quarter-Brick Exa) +10% to -50%
  (Sixteenth Brick) +10% to -10%

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:** 16-40 V **28E:** 16-70 V **28V:** 9-40 V **28VE:** 9-70 V **48:** 34-75 V **150:** 90-210 V **270:** 155-425 V **270HL:** 180-425 V **270H:** 240-425 V **270N:** 240-280 V	**1R2:** 1.2 V **1R5:** 1.5 V **1R8:** 1.8 V **2R5:** 2.5 V **3R3:** 3.3 V **05:** 5.0 V **07:** 7.0 V **7R5:** 7.5 V **08:** 8.0 V **10:** 10 V	**12:** 12 V **15:** 15 V **24:** 24 V **28:** 28 V **36:** 36 V **40:** 40 V **48:** 48 V **50:** 50 V **135:** 135 V **270:** 270 V	**FZ:** Full Brick (Zeta) **FE:** Full Brick (Exa) **FP:** Full Brick (Peta) **FT:** Full Brick (Tera) **HY:** Half Brick (Yota) **HZ:** Half Brick (Zeta) **HP:** Half Brick (Peta) **HT:** Half Brick (Tera) **QE:** Quarter Brick (Exa) **QT:** Quarter Brick (Tera) **SG:** Sixteenth Brick (Giga) **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

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

* Not all features apply, see individual product data sheet for product specifics.

Mil-COTS Listed by Package Size & Output Voltage

MCOTS-28	Vout	1.8 V	3.3 V	5 V	7 V	12 V	15 V	24 V	28 V	40 V	48 V	50 V	135 V	270 V
16-40 Vin Cont. 50 Vin 1s Trans. Absolute Max Vin = 60 V	Full Zeta													3.7 A 999 W
	1/2 Zeta			60 A 300 W		42 A 504 W	34 A 510 W	21 A 504 W	18 A 504 W	12.5 A 500 W		10 A 500 W	3.7 A 500 W	
	1/2 Peta	60 A 108 W	50 A 165 W	40 A 200 W		16 A 192 W	13 A 195 W	8 A 192 W	7 A 196 W	5 A 200 W	4 A 192 W			
	1/4 Exa			40 A 200 W		25 A 300 W	20 A 300 W		10.7 A 300 W			6 A 300 W		
	1/4 Tera	40 A 72 W	30 A 99 W	24 A 120 W	17 A 119 W	10 A 120 W	8 A 120 W	5 A 120 W	4 A 112 W		2.5 A 120 W			
	1/16 Giga		15 A 50 W	10 A 50 W	7 A 49 W	4 A 48 W	3.3 A 50 W	2 A 48 W	1.8 A 50 W		1.04 A 50 W			

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

MCOTS-28E	Vout	5 V	9.6 V	12 V	28 V	50 V
16-70 Vin Cont. 100 Vin 1s Trans. Absolute Max Vin = 100 V	1/2 Zeta	60 A 300 W	42 A 403 W	33 A 396 W	14 A 392 W	8 A 400 W

MCOTS-28E Demi	Vout	5 V
16-70 Vin Cont. 100 Vin 1s Trans. Absolute Max Vin = 100 V	Demi Brick	10 A 50 W

MCOTS-28V	Vout	3.3 V	5 V	7 V	12 V	15 V	24 V	28 V	48 V	50 V
9-40 Vin Cont. 55 Vin 1s Trans. Absolute Max Vin = 60 V	1/2 Yota				42 A 504 W			18 A 504 W		
	1/2 Zeta		50 A 250 W		21 A 252 W	17 A 255 W	10 A 240 W	9 A 252 W		5 A 250 W
	1/2 Peta		36 A 180 W		15 A 180 W	12 A 180 W	7.5 A 180 W	6.5 A 182 W	3.7 A 178 W	
	1/4 Tera	25 A 83 W	17 A 85 W	12 A 84 W	7 A 84 W	5.5 A 83 W	3.5 A 84 W	2.8 A 78 W		

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

MCOTS-48	Vout	1.8 V	3.3 V	5 V	7 V	12 V	15 V	24 V	28 V	30 V	40 V	48 V	50 V
34-75 Vin Cont. 100 Vin 1s Trans. Absolute Max Vin = 100 V	1/2 Zeta			60 A 300 W		50 A 600 W	40 A 600 W	25 A 600 W	21.5 A 602 W		15 A 600 W		12 A 600 W
	1/2 Peta		60 A 198 W	46 A 230 W		21 A 252 W	17 A 255 W	10.5 A 252 W	9 A 252 W			5.2 A 250 W	
	1/4 Tera		30 A 99 W	25 A 125 W	20 A 140 W	12 A 144 W	10 A 150 W	6 A 144 W		5 A 150 W		3 A 144 W	
	1/16 Giga	25 A 45 W	15 A 50 W	10 A 50 W	7 A 49 W	4 A 48 W	3.3 A 50 W		1.8 A 50 W			1.04 A 50 W	

MCOTS-150	Vout	5 V	28 V	48 V
90-210 Vin Cont. 250 Vin 1s Trans. Absolute Max Vin = 250 V	1/4 Tera	30 A 150 W	5.35 A 150 W	3.1 A 149 W

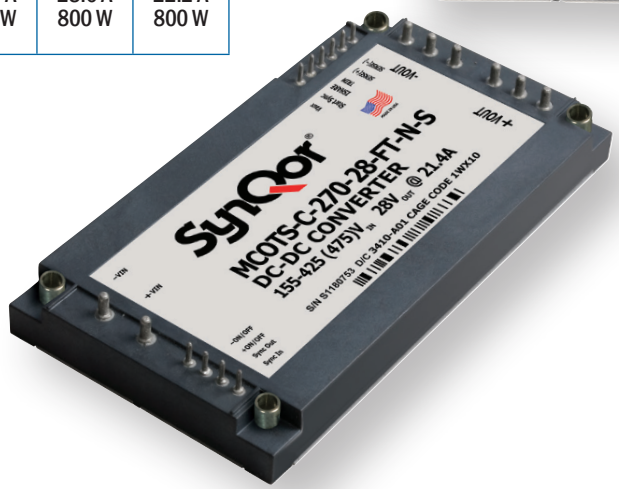
MCOTS-270	Vout	3.3 V	5 V	6 V	12 V	15 V	24 V	28 V	40 V	48 V	60 V
155-425 Vin Cont. 475 Vin 1s Trans. Absolute Max Vin = 600 V	Full Exa								60 A 1000 W		40 A 1000 W
	Full Tera		80 A 400 W		50 A 600 W	40 A 600 W	25 A 600 W	21.4 A 599 W		12.5 A 600 W	
	1/2 Exa								35 A 600 W		25 A 600 W
	1/2 Tera	60 A 198 W	50 A 250 W	33 A 198 W	25 A 300 W	20 A 300 W	12.5 A 300 W	10.7 A 300 W		6.3 A 302 W	
	1/4 Tera	30 A 99 W	30 A 150 W	25 A 150 W	13 A 156 W	10 A 150 W	6.25 A 150 W	5.35 A 150 W		3.1 A 149 W	

MCOTS-270	Vout	5 V	12 V	28 V	48 V
230-425 Vin Cont. 475 Vin 1s Trans. Absolute Max Vin = 600 V	1/2 Peta	70 A 350 W	42 A 500 W	18 A 500 W	10.4 A 500 W

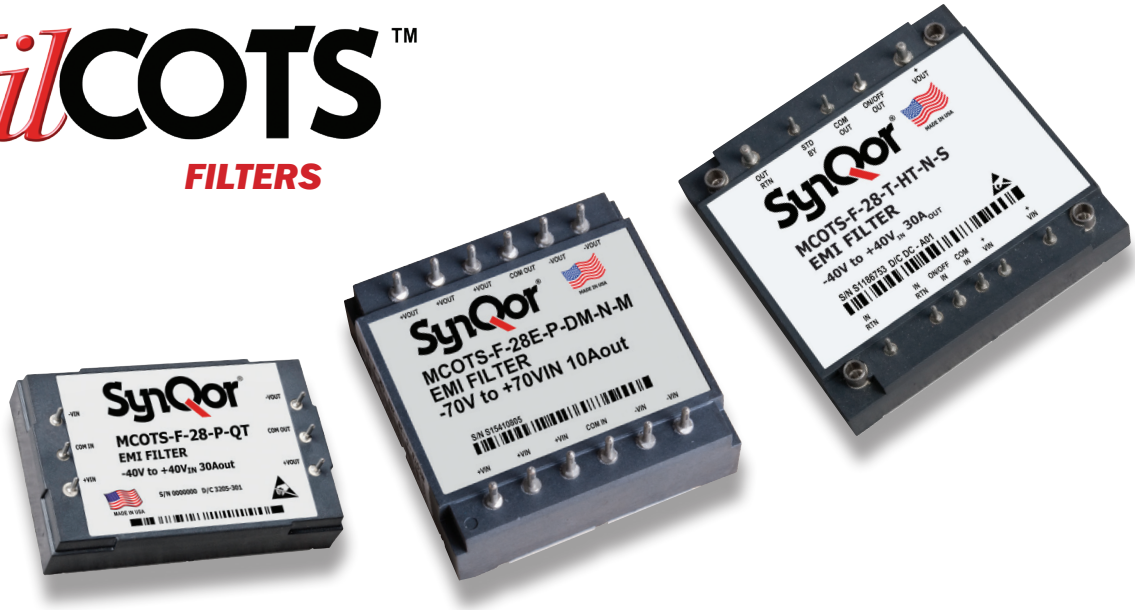
MCOTS-270N	Vout	8 V	10 V	12 V	28 V
240-280 Vin Cont. 200-350 Vin 100ms Trans. Absolute Max Vin = 600 V	1/2 Tera	50 A 400 W	40 A 400 W	33 A 396 W	14.5 A 406 W

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

MCOTS-270HL	Vout	36 V
180-425 Vin Cont. 475 Vin 1s Trans. Absolute Max Vin = 600 V	Full Brick Tera	16.7 A 600 W



MilCOTS™ 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.

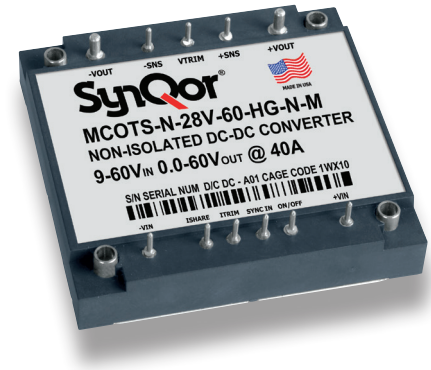
MCOTS DC Filter Features

- 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

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-HE	±40 V	+100 V, -50 V	40 A	2250 V	32.5 mΩ	>80 dB @ 250 kHz	>36 dB @ 250 kHz
MCOTS-F-28-P-HP	±40 V	±40 V	70 A	2250 V	5.5 mΩ	>90 dB @ 250 kHz	>25 dB @ 250 kHz
MCOTS-F-28-T-HT	±40 V	+100 V, -50 V	30 A	2250 V	40 mΩ	>80 dB @ 250 kHz	>36 dB @ 250 kHz
MCOTS-F-270-P-HT	±500 V	±630 V	9 A	2500 V	106 mΩ	>70 dB @ 250 kHz	>50 dB @ 250 kHz
QUARTER BRICK							
MCOTS-F-28-P-QT	±40 V	±50 V	30 A	2250 V	20 mΩ	>80 dB @ 250 kHz	>36 dB @ 250 kHz
MCOTS-F-48-P-QT	±80 V	±100 V	20 A	2250 V	32 mΩ	>80 dB @ 250 kHz	>36 dB @ 250 kHz
MCOTS-F-270-P-QT	±500 V	±630 V	4.0 A	2500 V	180 mΩ	>80 dB @ 500 kHz	>50 dB @ 500 kHz
DEMI BRICK							
MCOTS-F-28-P-DM	±40 V	±50 V	10 A	1000 V	60 mΩ	>80 dB @ 500 kHz	>60 dB @ 500 kHz
MCOTS-F-28E-P-DM	±70 V	±100 V	10 A	1000 V	60 mΩ	>80 dB @ 500 kHz	>60 dB @ 500 kHz

MilCOTS™

High Voltage Non-Isolated



Mil-COTS High Voltage, Non-Isolated DC-DC Converters

The high input voltage non-isolated DC-DC converters offer unique solutions for converting high-powered, variable voltages to a wide range of output voltages. The converter is a non-isolated buck-boost regulator, which employs synchronous rectification to achieve extremely high conversion efficiency. These products are suitable for use in Intermediate Bus Architectures, or to provide a regulated output voltage from a variable voltage source such as a battery. They can be configured to 'buck' the input voltage down or 'boost' the input voltage up with a single external setpoint resistor.

Battery Charging Features

Key feature of Trimmable Current Limit

- Provides the power conversion platform for battery charging
- Output current limit is externally controlled for constant-current charging
- Current can be set with an external resistor or an active circuit
- Current analog signal provided for instrumentation and control functions
- Ideal diode output stage with zero back-drive currents prevents discharge of battery when not charging
- Output voltage set-point is independently controlled through trim pin
- Unit will smoothly transition between current and voltage modes as charging cycle needs change

Operational Features

- Ultra-high efficiency up to 97%
- Wide input voltage ranges: 9-60 V (28 V); 9-90 V (28 VE)
- Buck/Boost Mode available
- Maximum input/output currents up to 40 A
- Suitable for use in Intermediate Bus Architectures
- On-board input and output filtering
- No minimum load requirement
- -55 °C to +100 °C Operating Temperature
- Remote sense and wide output voltage trim (Half-brick only)

Protection

- Input under-voltage lockout (UVLO)
- Output current limit (OCP) and short circuit protection
- Output over-voltage protection (OVP)
- Thermal shutdown (OTP)
- Output voltage trim

Mil-COTS Non-Isolated DC-DC Converters

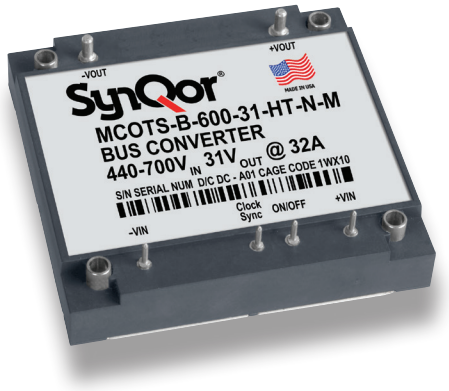
Family	Product	Vin Range	Vout	Package Size	Thermal Design	Screening Level
MCOTS	N: Non-isolated Converter	28V: 9-60 V 28VE: 9-90 V	60: 0-60 V 90: 0-90 V	EP: Eighth-brick Peta QT: Quarter-brick Tera HG: Half-brick Giga	N: Encased, Threaded Baseplate D: Encased, Non-threaded Baseplate F: Encased, Flanged Baseplate	S: S-Grade M: M-Grade

Example: MCOTS-N-28VE-90-HG-N-M For valid part numbers, refer to the website or contact your local sales representative.

Model Number	Brick Size	Input Voltage	Output Voltage	Current	Max Output Power	High Efficiency
MCOTS-N-28V-60-HG	Half-brick	9-60 V	0-60 V	40 A	2000 W	96% Efficiency
MCOTS-N-28V-60-QT	Quarter-brick	9-60 V	0-60 V	25 A	1500 W	96% Efficiency
MCOTS-N-28V-60-EP	Eighth-brick	9-60 V	0-60 V	15 A	900 W	95% Efficiency
MCOTS-N-28VE-90-HG	Half-brick	9-90 V	0-90 V	26 A	2000 W	96% Efficiency
MCOTS-N-28VE-90-QT	Quarter-brick	9-90 V	0-90 V	18 A	1500 W	97% Efficiency
MCOTS-N-28VE-90-EP	Eighth-brick	9-90 V	0-90 V	10 A	900 W	96% Efficiency

MilCOTS™

Bus Converters



Mil-COTS Rugged, High Efficiency Next Generation DC-DC Bus Converters

These Military bus converters are the next-generation, board-mountable, isolated, fixed switching frequency DC-DC converters that use synchronous rectification to achieve extremely high conversion efficiency. MCOTS Bus converters are ideal for creating the mid-bus voltage required to drive point-of-load (non-isolated) converters in Intermediate Bus Architectures.

Operational Features

- High efficiency, up to 97% at full rated load current
- Delivers up to 65 A @ full power with minimal derating
- Operating input voltage range: 230-400 V, 440-700 V, 700-900 V, and 800-1000 V
- Fixed frequency switching provides predictable EMI
- No minimum load requirement
- Industry standard half-brick pin-out configuration
- -55 °C to +100 °C Operating Temperature

Protection

- Input under-voltage and over voltage lockout protects against abnormal input voltages
- Output current limit and short circuit protection (auto recovery)
- Thermal shutdown
- On/Off control referenced to input side
- Inherent current share (by droop method) for high current and parallel applications
- Clock synchronization (primary reference)

Model Number	Package Size	Input Voltage	Input Transient	Output Voltage	Output Current	Max Output Power	Efficiency
MCOTS-B-270-31-HT	Half-Brick	230-400 V	155-450 V	29.7 V	32.5 A	1000 W	95%
MCOTS-B-385-270-HT	Half-Brick	230-400 V	155-450 V	270 V	3.7 A	900 W	95%
MCOTS-B-600-31-HT	Half-Brick	440-700 V	400-750 V	30.3 V	32.5 A	1000 W	95%
MCOTS-B-270-31-FT	Full-Brick	230-400 V	155-450 V	31 V	65 A	2015 W	97%
MCOTS-B-800-48-FT	Full-Brick	700-900 V	700-950 V	50 V	63 A	3000 W	97%
MCOTS-B-900-28-FT	Full-Brick	800-1000 V	800-1050 V	28 V	107 A	3000 W	97%
MCOTS-B-900-48-FT	Full-Brick	800-1000 V	800-1050 V	50 V	60 A	3000 W	96%

Family	Product	Vin Range	Vout	Package Size	Thermal Design	Screening Level
MCOTS	B: Bus Converter	270: 230-400 V 385: 230-400 V 600: 440-700 V 800: 700-900 V 900: 800-1000 V	28: 28 V 31: 31 V 48: 48 V 270: 270 V	HT: Half-brick Tera FT: Full-brick Tera	N: Encased, Threaded Baseplate D: Encased, Non-Threaded Baseplate F: Encased, Flanged Baseplate	S: S-Grade M: M-Grade

Part Numbering Example: MCOTS-B-600-31-HT-N-M For valid part numbers, refer to the website or contact your local sales representative.

Advancing the Power Curve®

Located in Salem, NH USA, SynQor is a leading supplier of power conversion solutions to the military, avionics, transportation, medical, industrial, telecommunications and computing markets. SynQor's innovative products are designed to exceed the demanding performance, quality, and reliability requirements of today's power electronic engineers who develop leading-edge infrastructure hardware. SynQor provides all the power conversion modules needed to build a power system, and it also provides complete power systems. SynQor's capabilities include both standard and custom solutions, and it delivers them with industry leading service and support. SynQor's total commitment to quality, customer satisfaction and continuous improvement drives our business processes.

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SynQor®

MilCOTS™

Product Screening & Qualification

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-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 at full load	15 (0)	Method 1005.8
Shock-Vibration	Visual, mechanical and electrical test before, during and after shock and vibration tests	5 (0)	–
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
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)	–