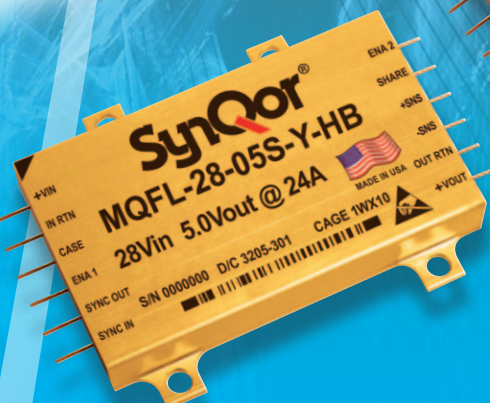
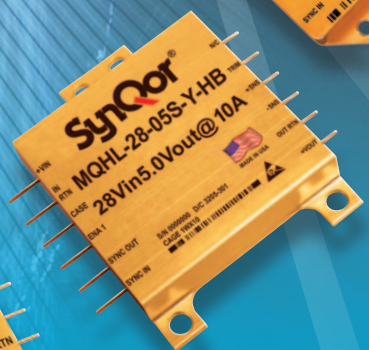
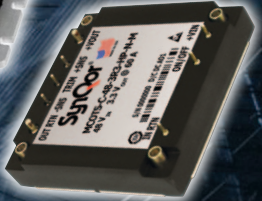
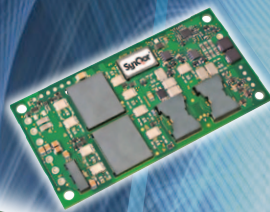




ADVANCING THE POWER CURVE

**DC-DC CONVERTERS,
AC-DC POWER SUPPLIES,
& EMI FILTERS**



SUMMER 2011
PRODUCT CATALOG

SynQor®

NiQor®

High & low voltage,
non-isolated
DC-DC converters
See page NQ-30



ACuQor®

Medical & Industrial-grade highly efficient
AC-DC power supplies
See page AQ-38



PowerQor®

48V input, single & dual output
isolated DC-DC converters
See page PQ-8



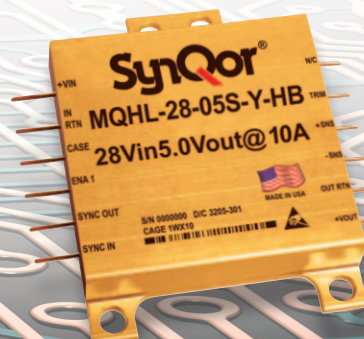
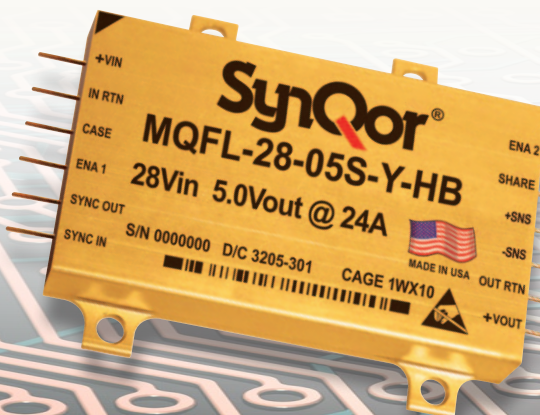
BusQor®

High efficiency
DC-DC bus converters
See page BQ-28

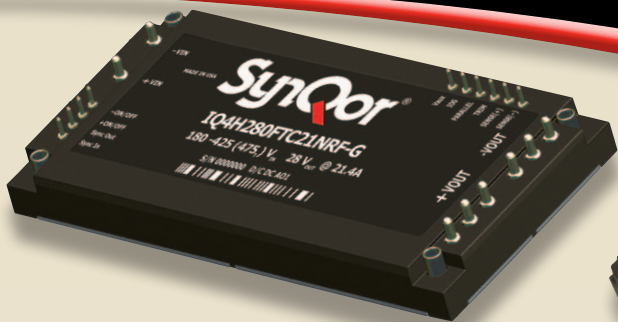


iQor™

Advanced Telecommunications
Computing Architecture (ATCA™)
power interface module
See page page iQ-36



DC-DC CONVERTERS, AC-DC POWER SUPPLIES, & EMI FILTERS



InQor[®]

Next-generation, ruggedized
isolated DC-DC converters
See page IQ-12



MilQor[®] Mil-COTS

Military "Off-The-Shelf" DC-DC converters
for cost sensitive applications
See page MCQTS-20

MilQor[®] Hi-Rel

High-Reliability
Military/Aerospace
DC-DC Converters
See page Hi-Rel-24



PowerQor®

48V input, single and dual output isolated DC-DC converters for telecom/networking applications

- ▶ Ultra-high Efficiency up to 97% at full rated load
- ▶ Full power from -40 to +100 °C
- ▶ Wide input voltage ranges: 18-75V – 35-75V
- ▶ 100V, 100ms transient input voltages
- ▶ Fixed frequency switching, low output noise
- ▶ No minimum load requirement

ACuQor®

Medical and industrial-grade AC-DC power supplies with PFC

- ▶ High efficiency up to 93% at full rated load
- ▶ Delivers up to 1400W of output power (1800W transient)
- ▶ Semi-regulated output
- ▶ Universal 85-264V AC Input Voltage (47-63Hz)
- ▶ CF Patient Contact
- ▶ Defibrillation Proof

CFQor

Medical Grade DC-DC Converters

- ▶ High Efficiency, up to 93% at full rated load
- ▶ Industry standard quarter-brick pin-out configuration
- ▶ Reinforced Insulation
- ▶ 4250V, 100MΩ input-to-output
- ▶ CF Patient Contact
- ▶ Defibrillation Proof

MilQor®

Hi-Rel

High-Reliability, field proven DC-DC converters for military/aerospace applications

- ▶ Efficiency up to 90% at full rated load
- ▶ Full power from -55 to +125 °C
- ▶ 28V and 270V nominal input voltages
- ▶ Parallel operation with current share

Mil-COTS

“Off-the-shelf” DC-DC converters for military/aerospace cost sensitive applications

- ▶ Efficiency: >95% at full load
- ▶ Full power from -55 to +100 °C
- ▶ 9V to 425V continuous input voltage ranges
- ▶ Output power up to 600W

BusQor®

Open-frame, high efficiency next generation DC-DC bus converters

- ▶ Ultra-high efficiency up to 98% at full rated load
- ▶ Delivers 6V, 9.6V or 12V bus for Intermediate Bus Architectures (IBA)
- ▶ Unregulated & Semi-regulated models
- ▶ Wide input voltage ranges:
 - 42V - 53V (BQ50)
 - 35V - 55V (BQ55)
 - 36V - 75V (SQ60)

iQor™

Advanced Telecommunications Computing Architecture (ATCA™) power interface module

- ▶ 100V/1ms transient protection
- ▶ Auxiliary supply voltages: 3.3V@3.6A and 5.0V@150mA
- ▶ Trimmable 50-95V hold-up capacitance voltage

InQor®

Next-generation, ruggedized isolated DC-DC converters for industrial applications

- ▶ High Efficiency up to 95% at full rated load
- ▶ Full power from -40 to +100 °C
- ▶ Input voltage ranges from 9V-160V & 180V-425V
- ▶ Output power up to 600W
- ▶ Fixed frequency switching, low output noise
- ▶ No minimum load requirement
- ▶ Conduction Cooled, Ruggedized Package

NiQor®

High voltage, non-isolated DC-DC converters for industrial applications

- ▶ Ultra-high efficiency up to 95%
- ▶ Wide input & output voltage ranges
- ▶ Buck or Buck/Boost Mode available
- ▶ Maximum input/output currents up to 80A
- ▶ Trimmable Current Limit for Battery Charging Applications
- ▶ Suitable for use in Intermediate Bus Architectures
- ▶ On-board input and output filtering
- ▶ No minimum load requirement
- ▶ Remote sense and wide output voltage trim

SIP & SMT Low voltage, DC-DC converters, non-isolated buck regulators

- ▶ Ultra-high efficiency up to 95%
Used at the point of load for low voltage outputs
- ▶ Wide trim module can be programmed to a variety of output voltages

EMI Filter Modules

For InQor and MilQor DC-DC converters

- ▶ Low DC resistance
- ▶ >80dB differential noise attenuation @500kHz
- ▶ >50dB common-mode noise attenuation @500kHz
- ▶ Bulk capacitance provides input system stabilization for downstream power converters

Product Guide

Isolated DC-DC Converters

PowerQor and DualQor

Single and Dual Output, Isolated Converters.....PQ-8

InQor

Ruggedized Industrial Converters.....IQ-12

CFQor

Medical Grade DC-DC ConvertersCFQ-19

MilQor Mil-COTS

“Off-The-Shelf” Converters (Military/Aerospace) MCOTS-20

MilQor Hi-Rel

High-Reliability Converters (Military/Aerospace) Hi-Rel-24

BusQor (BUS CONVERTER)

Single Output, Isolated Bus Converters BQ-28

Non-Isolated DC-DC Converters

NiQor (High-Voltage)

Single Output, Non-Isolated Converters NQ-30

NiQor

Single Output, Non-Isolated Converters NQ-32

EMI FILTERS

InQor, Mil-COTS, Hi-Rel

Product Features..... EMI-34

ATCA modules

iQor

ATCA Interface Module iQ-36

AC-DC power supplies

ACuQor

Medical/Industrial-Grade AC-DC Converters..... AQ-38

General Information

Package Outlines..... Package-41

Manufacturing Overview MFG-50



SynQor is a leading supplier of power conversion solutions to the communications, computing and industrial markets. SynQor's innovative products are designed to exceed the demanding performance, quality, and reliability requirements of today's power electronic engineers that are developing leading-edge infrastructure hardware.

Our global customer base extends from small Original Equipment Manufacturers to Fortune 500 multinationals and includes the 12 largest telecom OEMs in the world.

SynQor's capabilities include both standard and custom solutions for distributed power architectures and we deliver them with industry leading service and support. SynQor's total commitment to quality, customer satisfaction and continuous improvement drive our business processes and lay the foundation for our success.

Dr. Martin F. Schlecht
President, Chairman,
& CEO

INDUSTRIAL



... the power behind industry

SynQor's ruggedized DC-DC converters and filters are designed for a wide range of industrial applications including those required to withstand harsh environments: railway and transportation systems, industrial motion control, information displays, factory automation and power generation systems. SynQor converters feature a two-stage power topology with synchronous-rectification that greatly improves efficiency and optimizes the power dissipated by the converter.

InQor

- Isolated DC-DC Converters

NiQor HV (High Voltage)

- High Voltage Non-Isolated DC-DC Converters

ACuQor

- AC-DC Power Supplies

NiQor

- Non-Isolated DC-DC Converters

BusQor

- Bus Converters

InQor Filters

- EMI Filters

MEDICAL



... the power behind innovation

The ACuQor product line offers the best-in-class solutions for AC-DC power supplies designed to meet an extensive range of medical applications. Packing 500W of useable power into just 3.5" x 5.25" x 1.63", the E-Series is the world's smallest cardiac care, medical grade AC-DC converter for this power level. The G-Series provides 1400W of useable power in a 4.75" x 7" x 1.63" package. The medical grade version meets UL60601-1 safety for cardiac contact without requiring an external isolation transformer. It also meets EN-61000-3-2 for PFC and EN60601-1 low leakage current.

ACuQor

- AC-DC Power Supplies

CFQor

- CF Grade Isolated DC-DC Converters

InQor

- Isolated DC-DC Converters

NiQor

- High Voltage Non-Isolated DC-DC Converters
- Non-Isolated DC-DC Converters

TELECOM/DATACOM



... the power behind communications

SynQor is the worldwide leader in technology, quality and service for high-efficiency DC-DC converters for the telecom/datacom marketplace. SynQor's isolated, high-efficiency, open-frame DC-DC converter product lines combine our unmatched lead-times, flexibility and design support that the worldwide telecom market requires.

PowerQor

- 48V Single and Dual Output Isolated DC-DC Converters

BusQor

- Bus Converters

NiQor

- Non-Isolated DC-DC Converters

iQor

- ATCA Power Interface Module

InQor

- EMI Filters

MILITARY/AEROSPACE



... the power behind strength

The MilQor series of Hi-Rel and Mil-COTS DC-DC converters and EMI filters brings SynQor's field proven high-efficiency synchronous-rectifier technology to the Military/Aerospace industry. Our innovative QorSeal™ packaging approach ensures survivability in the most hostile environments. MilQor products are designed and manufactured to comply with military standards.

MilQor

- 28V & 270V Single and Dual Output Isolated DC-DC Converters
- Extended input voltage ranges available (28E, 28V, 28VE, 270L)
- Bus Converters
- EMI Filters



Isolated DC-DC Converters

48V INPUT, SINGLE AND DUAL OUTPUT ISOLATED DC-DC CONVERTERS FOR TELECOM/NETWORK APPLICATIONS

Single and dual output converters are composed of next-generation, board-mountable, isolated, fixed switching frequency DC-DC converters that use synchronous rectification to achieve extremely high power conversion efficiency. The power dissipated by the converter is so low that a heatsink is not required, which saves cost, weight, height, and application effort. All of the power and control components are mounted to the multi-layer PCB substrate.

PRODUCT FEATURES

OPERATIONAL

- Ultra-high efficiency up to 97%
- Wide input voltage ranges:
 - 18-36V (PQ24)
 - 18-60V (PQ30)
 - 18-75V (PQ40)
 - 35-75V (PQ48, PQ60, DQ6)
 - 44-52V (PQ50)
 - 38-55V (PQ55)
 - 40-75V (PQ65)
- Withstand up to 100V, 100ms input voltage transient (PQ60, PQ40 models only)
- Fixed frequency switching, low output noise
- No minimum load requirement (except PQ60525HTA04)

GENERAL SPECIFICATIONS

- | | |
|-----------------------------|--------------------|
| • Operating Temperature | -40°C to +100°C |
| • Output Voltage Set Point | ±1.0% - 1.5% |
| • Output Voltage Ripple | <1% of Vout (typ.) |
| • Input Ref. Ripple Current | <1% of Iin (typ.) |
| • Switching Frequency | 200 - 300kHz |
| • Transient Response | ±50 - 300mV |
| • Output Voltage Trim Range | +10% to -20% |
| – (Sixteenth Brick) | +10% to -10% |
| – (Half Brick Zeta) | +10% to -50% |
| • Isolation Voltage | Up to 2250Vdc |

PROTECTION/CONTROL

- Input under-voltage lockout (UVLO)
- Output current limit (OCP) and short circuit protection
- Output over-voltage protection (OVP)
- Thermal shutdown (OTP)
- Back-drive protection (starts into pre-biased load)
- On/Off control referenced to input side
- Remote sense
- Output voltage trim (industry std. trim equations)

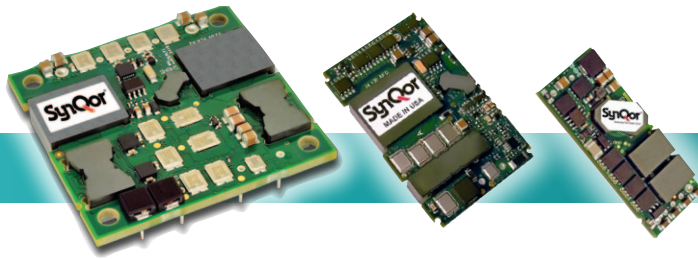
MECHANICAL

- Industry standard pin-out configurations
- Industry standard footprints:
 - Sixteenth Brick: 0.95" x 1.35"
 - Eighth Brick: 0.90" x 2.3"
 - Quarter Brick: 1.45" x 2.3"
 - Half Brick: 2.3" x 2.4"
 - Full Brick: 4.6" x 2.4"
- Open-frame, single board construction for higher reliability (baseplated versions also available)

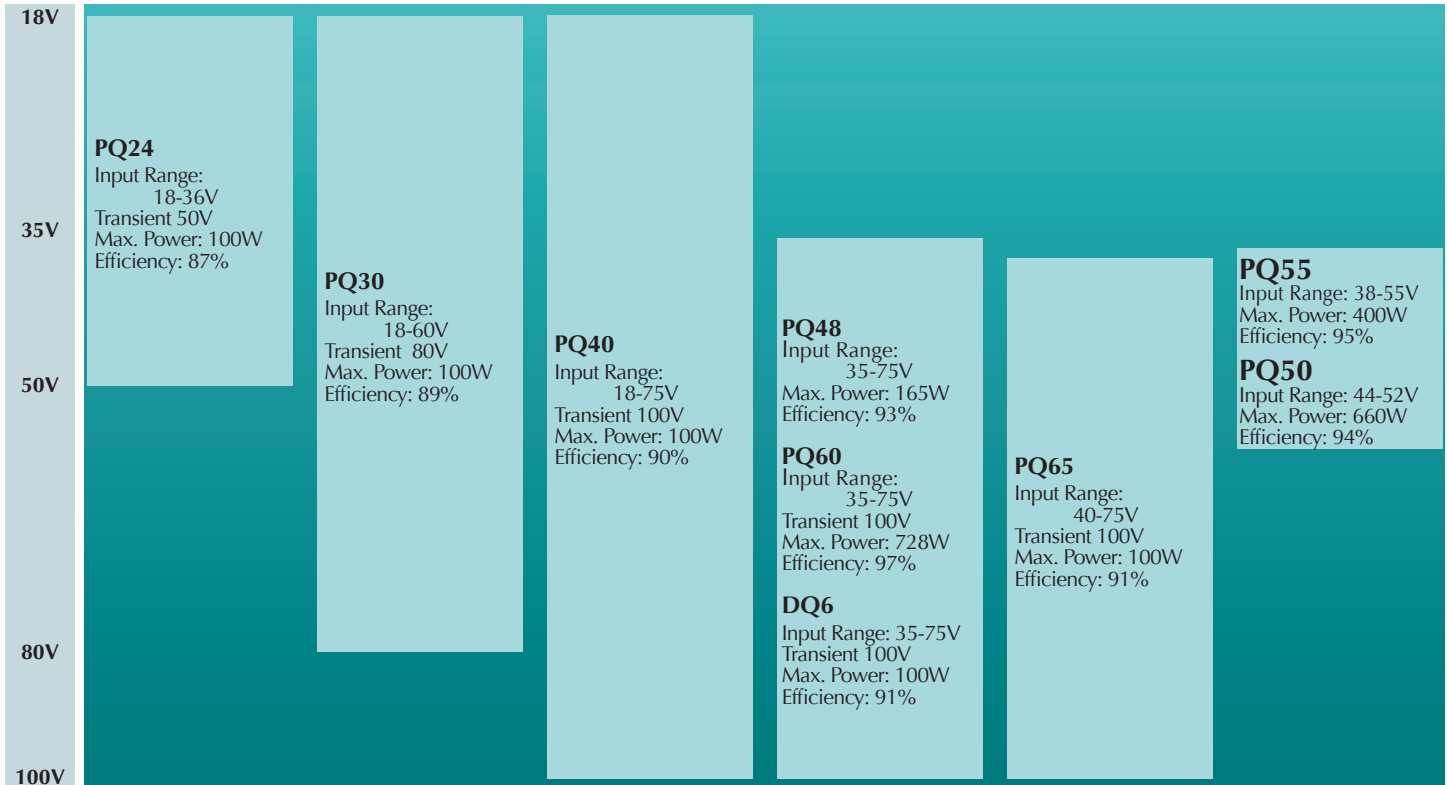
SAFETY

- Up to 2250V, 30MΩ input-to-output isolation
- Basic insulation rating
- EN 60950-1:2006/A11:2009/A1:2010
- UL 60950-1:2007
- CAN/CSA C22.2 NO. 60950-1:2007

See pages Package-41&42 for Package Outlines



PowerQor & DualQor PRODUCT FAMILY MATRIX



PowerQor PART NUMBERING GUIDE

Base Part Number							Option Descriptions			
Product Family	Cont. Input Voltage	Output Voltage		Package Size	Performance Series	Thermal Design	Max. Output Current	Enable Logic	Pin Length	Features
PQ	24: 18-36V 30: 18-60V 40: 18-75V 48: 35-75V 50: 44-52V 55: 38-55V 60: 35-75V 65: 40-75V	010: 1V 012: 1.2V 015: 1.5V 018: 1.8V 020: 2V 025: 2.5V 033: 3.3V 050: 5V 053: 5.3V 060: 6V	080: 8V 090: 9V 120: 12V 150: 15V 180: 18V 240: 24V 260: 26V 280: 28V 480: 48V 525: 52.5V 530: 53V 540: 54V	S: Sixteenth Brick E: Eighth Brick Q: Quarter Brick H: Half Brick F: Full Brick	K: Kilo M: Mega G: Giga T: Tera P: Peta E: Exa Z: Zeta	A: Open frame B: Baseplate L: Low profile M: Low Profile Baseplate	25: 25A 30: 30A 40: 40A 60: 60A 80: 80A A0: 100A <small>(not all models are shown)</small>	P: Pos. N: Neg.	K: 0.110" N: 0.145" R: 0.180" Y: 0.250"	S: Standard Feature F: Full Feature

Part Numbering Example: PQ48033HMA30NRS

DualQor PART NUMBERING GUIDE

Product Family	Input Voltage	1st Output Voltage	2nd Output Voltage	Package Size	Performance Series	Thermal Design	Max Power Output	Enable Logic	Pin Length	Feature Set
DQ	6: 35-75V	50: 5.0V	33: 3.3V	Q: Quarter Brick	M: Mega	A: Open Frame	06: 60 Watts	N: Neg	N: 0.145"	S: Std

Part Numbering Example: DQ65033QMA06NNS

For valid part numbers, refer to the website or contact your local sales representative or distributor.

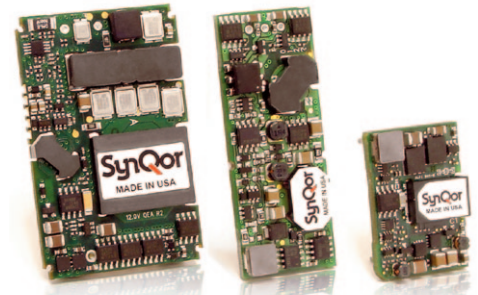
Isolated DC-DC Converters



PQ24	Series	1.8V	3.3V	5V	8V	12V	15V	28V
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24Vdc Input (18-36Vdc Input Range, 50Vdc Transient on Full Brick)

Full Brick	FTA							21.5A 600W
Quarter Brick	QGA	25A 45W	25A 83W	20A 100W		8.33A 100W	6.67A 100W	
	QGL		25A 83W					



PQ30	Series	3.3V	5V	8V	12V	15V
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24 and 48Vdc Input (18-60Vdc Input Range, 80Vdc Transient)

Quarter Brick	QGA	30A 100W				
		25A 83W				
Eighth Brick	EGA	20A 66W				

PQ55	Series	53V	54V
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48Vdc Input (38-55Vdc Input Range)

Half Brick	HEB	7.6A 400W	
	HTL		5A 275W

PQ40	Series	3.3V	5V	8V	12V	15V
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24 and 48Vdc Input (18-75Vdc Input Range, 100Vdc Transient)

Quarter Brick	QGA	25A 83W	20A 100W	9A 72W	8.33A 100W	6.67A 100W
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PQ65	Series	18V
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48Vdc Input (40-75Vdc Input Range, 100Vdc Transient)

Quarter Brick	QGA	5.6A 100W
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PQ48	Series	1.5V	1.8V	2V	2.5V	3.3V	5V	5.3V	12V	15V
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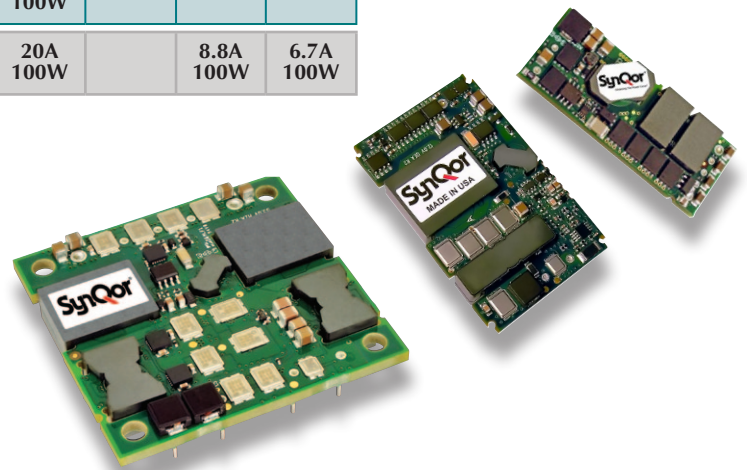
48Vdc Input (35-75Vdc Input Range)

Half Brick	HTA	60A 90W	60A 108W	60A 120W	60A 150W	50A 165W	33A 165W	30A 160W	14A 168W	11A 165W
	HGA	40A 60W	40A 72W	40A 80W	40A 100W	40A 132W			12A 144W	10A 150W
	HMA	30A 54W	30A 45A	30A 60W	30A 75W	30A 99W	25A 125W			
	HKA	20A 30W	20A 36W	20A 40W	20A 50W	20A 66W	20A 100W			
Quarter Brick	QNA	25A	25A	25A	25A	25A	20A		8.8A	6.7A
	QGA	37.5W	45W	50W	62.5W	82.5W	100W		100W	100W

PQ50	Series	5V	7.3V	9V	12V	18V
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48Vdc Input (44-52Vdc Input Range)

Half Brick	HZA		60A 438W		55A 660W	
	HPA	50A 250W				
	HTA					10A 180W
Quarter Brick	QGA			11A 99W		



Isolated DC-DC Converters



PQ60	Series	1.2V	1.5V	1.8V	2.5V	3.3V	5V	12V	15V	18V	24V 26V	28V	40V	50V 52.5V
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48Vdc Input (35-75Vdc Input Range, 100Vdc Transient)

Full Brick	FTA													26A 728W			
	HZA							60A 300W	50A 600W	40A 600W				25A 600W	21.5A 602W	15A 600W	12A 600W
Half Brick	HEA														12.8A 360W		
	HPA	100A 120W	100A 150W	100A 180W	80A 200W	70A 230W	45A 225W	20A 240W									
	HTA	60A 72W	60A 90W			50A 165W	33A 165W	14A 168W			9.2A 166W	10A 260W					3.85A 200W
	HGA					40A 132W	30A 150W										
	HMA					30A 99W											

PQ60	Series	1V	1.2V	1.5V	1.65V	1.8V	2.5V	3.3V	5V	6V	12V	15V	24V	48V
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48Vdc Input (35-75Vdc Input Range, 100Vdc Transient)

Quarter Brick	QZB													33A 400W			
	QEA													25A 300W			
	QEA													17A 204W			
	QPA	60A 60W	60A 72W	60A 90W		60A 108W	60A 150W	45A 150W						12A 144W			
	QTA	40A 40W	40A 48W	40A 60W	40A 66W	40A 72W	40A 100W	35A 115W	30A 150W					8.3A 100W			3.0A 144W
	QGA			25A 37.5W		25A 45W	25A 62.5W	25A 82.5W	20A 100W	17A 100W							5.0A 120W
	QML			15A 22.5W		15A 27W	15A 37.5W	15A 50W	15A 75W								
Eighth Brick	ETx			45A 67.5W		45A 81W	35A 87.5W	30A 99W									
	EGx	25A 25W	25A 30W	25A 37.5W		25A 45W	25A 62.5W	20A 66W	15A 75W				7.0A 84W	5.0A 75W	3.0A 72W		
	EGx	20A 20W	20A 24W	20A 30W		20A 36W	20A 50W										
	EMx	15A 15W	15A 18W	15A 22.5W		15A 37.5W	15A 27W	15A 50W	10A 50W				4.0A 48W				
	EKx		30A 36W	25A 37.5W		25A 45W	20A 50W	15A 50W	10A 50W				4.0A 48W	3.3A 50W			
Sixteenth Brick	SMx		25A 30W	25A 37.5W		25A 45W	20A 50W	15A 50W	10A 50W				4.0A 48W	3.0A 45W			

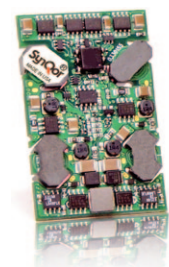
Dual Qor Isolated DC-DC Converters



DQ6	Series	2.4/1.2V	3.3/1.2V	3.3/1.5V	3.3/1.8V	3.3/2.5V	5.0/3.3V	+12/-12V
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48Vdc Input (35-75Vdc Input Range, 100Vdc Transient)

Quarter Brick	QGL		15/15A 68W	15/15A 73W	15/15A 77W	15/15A 88W	10/15A 100W	
	QMA				12/22A 40W	12/16A 40W	12/18A 60W	5/5A 60W
	QKA	8/16A 20W					8/9A 40W	





Isolated DC-DC Converters

NEXT-GENERATION, RUGGEDIZED ISOLATED DC-DC CONVERTERS FOR INDUSTRIAL APPLICATIONS

SynQor's ruggedized DC-DC converters and filters are designed for a wide range of industrial applications including those required to withstand harsh environments: railway and transportation systems, industrial motion control, information displays, factory automation and power generation systems. SynQor converters feature a two-stage power topology with synchronous-rectification that greatly improves efficiency and optimizes the power dissipated by the converter.

PRODUCT FEATURES

OPERATIONAL

- High efficiency up to 95%
- Input voltage ranges from 9V-160V and 180V-425V
- Output power up to 600W
- Fixed frequency switching, low output noise
- No minimum load requirement
- Full Feature optional on some models

GENERAL SPECIFICATIONS

- Operating Temperature -40°C to +100°C
- Output Voltage Set Point $\pm 1.0\%$
- Output Voltage Ripple <1% of Vout (typ.)
- Switching Frequency 240 - 350kHz
– (IQ4H QT and HT) 450 - 550kHz
- Transient Response <7% of Vout (typ.)
- Output Voltage Trim Range +10% to -20%
– (Sixteenth Brick) +10% to -10%
– (Half Brick Zeta) +10% to -50%
- Isolation Voltage Up to 4250Vdc

MECHANICAL

- Industry standard pin-out configurations
- Flanged baseplate available
- Industry standard footprints:
 - Full Brick: 2.48" x 4.69"
 - Half Brick: 2.39" x 2.49"
 - Quarter Brick: 1.54" x 2.39"
 - Sixteenth Brick: 1.04" x 1.44"

PROTECTION/CONTROL

- Input under-voltage lockout
- Output current limit and short circuit protection
- Active back bias limit prevents damage to converter from external load induced pre-bias
- Output over-voltage protection
- Thermal shutdown

SAFETY

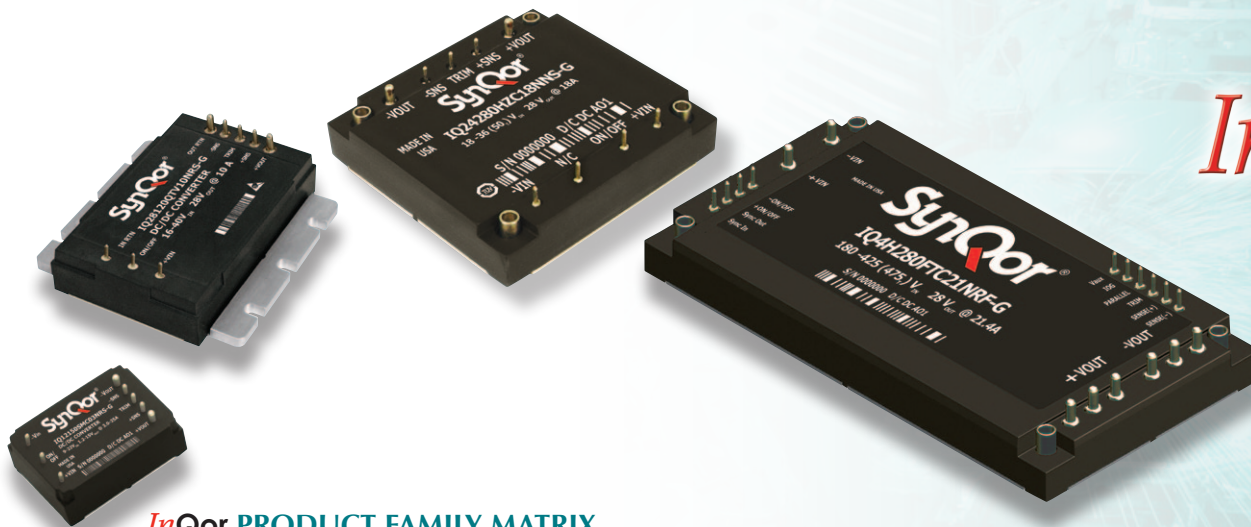
IQ12 - IQ48

- Basic Insulation
- 2250V, 30M Ω input-to-output isolation
- EN 60950-1:2006/A11:2009/A1:2010
- UL 60950-1:2007
- CAN/CSA C22.2 NO. 60950-1:2007

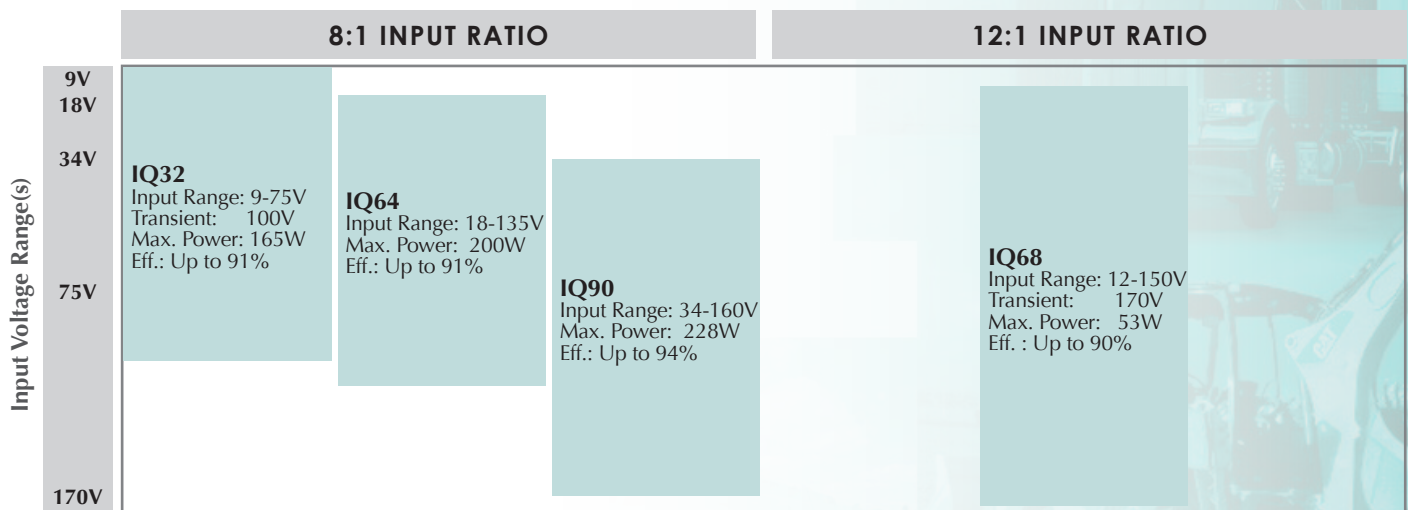
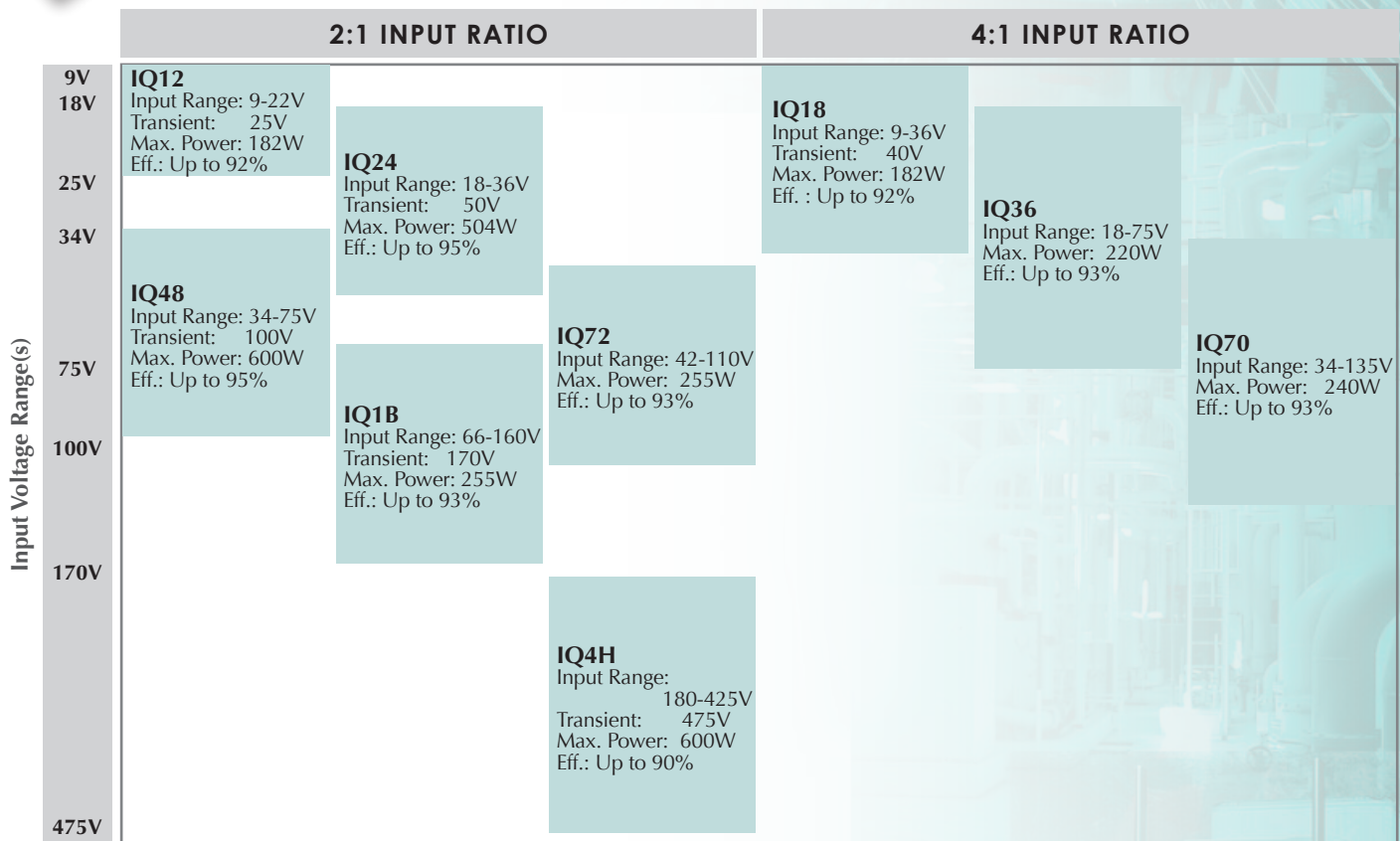
IQ64 - IQ4H

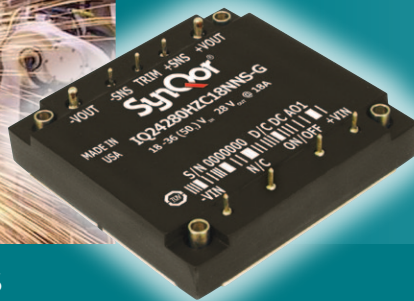
- Reinforced Insulation
- Up to 4250V, 100M Ω input-to-output isolation
- EN 60950-1:2006/A11:2009/A1:2010
- UL 60950-1:2007
- CAN/CSA C22.2 NO. 60950-1:2007
- CE marked

See pages Package-43-44 for package outlines



InQor PRODUCT FAMILY MATRIX





Isolated DC-DC Converters

InQor PART NUMBERING GUIDE

Product Family	Cont. Input Voltage	Output Voltage	Package Size	Performance Series	Thermal Design	Max. Iout	Options Description		
							Enable Logic	Pin Length	Features
IQ	12: 9-22V	012: 1.2V	S: Sixteenth Brick Q: Quarter Brick H: Half Brick F: Full Brick	K: Kilo M: Mega G: Giga T: Tera P: Peta E: Exa Z: Zeta	C: Encased D: Encased Non-threaded Baseplate V: Flanged Baseplate	60: 60A 50: 50A 30: 30A 10: 10A 06: 6A 02: 2A (not all shown)	N: Negative	R: 0.180"	S: Standard F: Full Feature
	18: 9-36V	015: 1.5V							
	24: 18-36V	018: 1.8V							
	32: 9-75V	025: 2.5V							
	36: 18-75V	033: 3.3V							
	48: 34-75V	050: 5V							
	64: 18-135V	070: 7V							
	68: 12-150V	120: 12V							
	70: 34-135V	150: 15V							
	72: 42-110V	240: 24V							
	90: 34-160V	280: 28V							
	1B: 66-160V	300: 30V							
	4H: 180-425V	400: 40V							
		480: 48V							
		500: 50V							
		720: 72V							
	960: 96V								

Part Numbering Example: IQ1B480QTC03NRS * For valid part numbers, refer to the website or contact your local sales representative or distributor.

2:1 input ratio listed by package and output voltage

IQ12	Series	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
		12Vdc Input (9-22Vdc Input Range, Transient 25V)													
Half Brick	HPC			60A 108W		50A 165W	36A 180W		15A 180W	12A 180W	7.5A 180W	6.5A 182W		4.5A 180W	3.7A 178W
	HTC			50A 90W		40A 132W	28A 140W		12A 144W	9.5A 143W	6A 144W	5A 140W		3.5A 140W	3A 144W
Quarter Brick	QTC			40A 72W		30A 99W	20A 100W	14A 98W	8A 96W	7A 105W	4A 96W		3A 90W		2A 96W
	QGC			30A 54W		20A 66W	15A 75W	10A 70W	6A 72W	5A 75W	3A 72W		2.4A 72W		1.5A 72W
	QMC										2A 48W		1.5A 45W		1A 48W
Sixteenth Brick	SMC	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W					
	SKC	20A 24W	16A 24W	14A 25W	10A 25W	8A 26W	5A 25W	3.5A 25W	2A 24W	1.7A 26W					

2:1 input ratio listed by package and output voltage

IQ24	Series	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V	50V
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24Vdc Input (18-36Vdc Input Range, Transient 50V)

Half Brick	HZC						60A 300W		42A 504W	34A 510W	21A 504W	18A 504W		12.5A 500W		10A 500W
	HEC											14A 392W				8A 400W
	HPC			60A 108W		50A 165W	40A 200W		18A 216W	15A 225W	9A 216W	7.5A 210W		5.5A 220W	4.5A 216W	
	HTC			50A 90W		40A 132W	30A 150W		13A 156W	10A 150W	6.5A 156W	5.5A 154W		4A 160W	3.3A 158W	
Quarter Brick	QTC			40A 72W		30A 99W	24A 120W	17A 119W	10A 120W	8A 120W	5A 120W		4A 120W		2.5A 120W	
	QGC			32A 58W		25A 83W	18A 90W	13A 91W	7.5A 90W	6A 90W	3.7A 89W		3A 90W		1.8A 91W	
	QMC												2A 60W		1.2A 58W	
Sixteenth Brick	SMC	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W						
	SKC	20A 24W	16A 24W	14A 25W	10A 25W	8A 26W	5A 25W	3.5A 25W	2A 24W	1.7A 26W						

IQ48	Series	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V	50V
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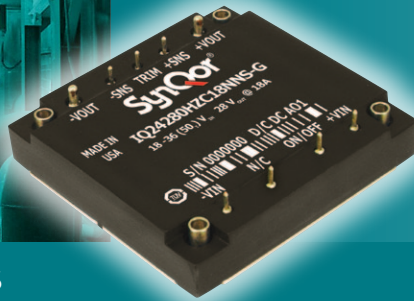
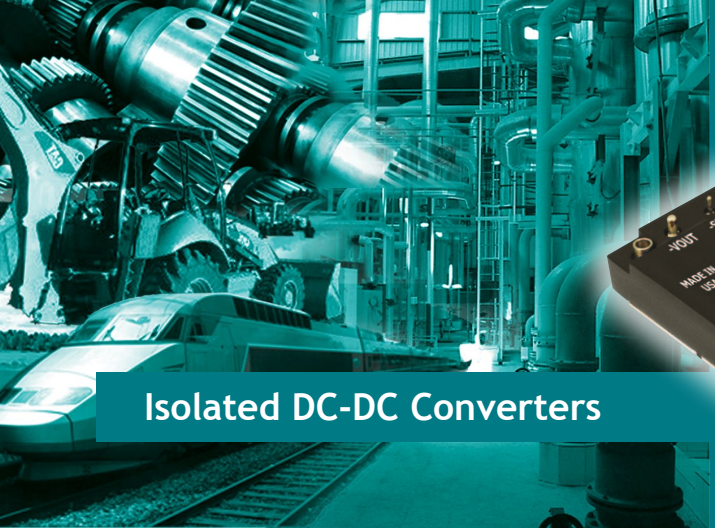
48Vdc Input (34-75Vdc Input Range, Transient 100V)

Half Brick	HZC						60A 300W		50A 600W	40A 600W	25A 600W	21.5A 602W		15A 600W		12A 600W
	HPC			60A 108W		60A 198W	46A 230W		21A 252W	17A 255W	10.5A 252W	9A 252W		6.3A 252W	5.2A 250W	
	HTC			50A 90W		45A 149W	34A 170W		16A 192W	13A 195W	8A 192W	7A 196W		5A 200W	4A 192W	
Quarter Brick	QTC			40A 72W		30A 99W	25A 125W	20A 140W	12A 144W	10A 150W	6A 144W		5A 150W		3A 144W	
	QGC			32A 58W		25A 83W	21A 105W	15A 105W	9A 108W	7A 105W	4.5A 108W		3.5A 105W		2.2A 106W	
	QMC												1.6A 48W		1A 48W	
Sixteenth Brick	SMC	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 48W	4A 48W	3A 45W						
	SKC	20A 24W	16A 24W	14A 25W	10A 25W	8A 26W	5A 25W	3.5A 25W	2A 24W	1.7A 26W						

IQ72	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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72Vdc Input (42-110Vdc Input Range)

Half Brick	HPC	60A 108W	60A 198W	46A 230W		21A 252W	17A 255W	10.4A 250W	9A 252W		6.3A 252W	5.2A 250W
	HTC	50A 90W	45A 149W	34A 170W		16A 192W	13A 195W	8A 192W	7A 196W		5A 200W	4A 192W
Quarter Brick	QTC	40A 72W	30A 99W	25A 125W	20A 140W	12A 144W	10A 150W	6A 144W		5A 150W		3A 144W
	QGC	32A 58W	25A 83W	20A 100W	15A 105W	9A 108W	7A 105W	4.5A 108W		3.5A 105W		2A 96W
	QMC									2A 60W		1.2A 58W



Isolated DC-DC Converters

2:1 input ratio listed by package and output voltage

IQ1B	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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110Vdc Input (66-160Vdc Input Range, Transient 170V)

Half Brick	HPC	60A 108W	60A 198W	48A 240W		21A 252W	17A 255W	10A 240W	9A 252W		6.3A 252W	5.2A 250W
	HTC	50A 90W	45A 149W	34A 170W		16A 192W	13A 195W	8A 192W	7A 196W		5A 200W	4A 192W
Quarter Brick	QTC	40A 72W	30A 99W	25A 125W	20A 140W	12A 144W	10A 150W	6A 144W		5A 150W		3A 144W
	QGC	32A 58W	23A 76W	18A 90W	15A 105W	9A 108W	7A 105W	4.5A 108W		3.5A 105W		2A 96W
	QMC	25A 45W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W	2A 48W		1.5A 45W		1A 48W

IQ4H	Series	1.8V	2.5V	3.3V	5V	12V	15V	24V	28V	48V	72V	96V
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385Vdc Input (180-425Vdc Input Range, Transient 475V)

Full Brick	FTC				80A 400W	50A 600W	40A 600W	25A 600W	21.4A 600W	12.5A 600W		
Half Brick	HTC	70A 126W	70A 175W	60A 198W	50A 250W	25A 300W	20A 300W	12.5A 300W	10.7A 300W	6.25A 300W	4.16A 300W	3.13A 300W
Quarter Brick	QTC	30A 54W	30A 75W	30A 100W	30A 150W	13A 156W	10A 150W	6.25A 150W	5.35A 150W	3.12A 150W		



4:1 input ratio listed by package and output voltage

IQ18	Series	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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18Vdc Input (9-36Vdc Input Range, Transient 40V)

Half Brick	HPC			60A 108W		50A 165W	36A 180W		15A 180W	12A 180W	7.5A 180W	6.5A 182W		4.5A 180W	3.7A 178W
	HTC			50A 90W		40A 132W	28A 140W		12A 144W	9.5A 143W	6A 144W	5A 140W		3.5A 140W	3A 144W
Quarter Brick	QTC			40A 72W		30A 99W	20A 100W	14A 98W	8A 96W	7A 105W	4A 96W		3A 90W		2A 96W
	QGC			30A 54W		20A 66W	15A 75W	10A 70W	6A 72W	5A 75W	3A 72W		2.4A 72W		1.5A 72W
	QMC										2A 48W		1.5A 45W		1A 48W
Sixteenth Brick	SMC	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W					
	SKC	20A 24W	16A 24W	14A 25W	10A 25W	8A 26W	5A 25W	3.5A 25W	2A 24W	1.7A 26W					

IQ36	Series	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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36Vdc Input (18-75Vdc Input Range)

Half Brick	HPC			60A 108W		50A 165W	40A 200W	30A 210W	18A 216W	14A 210W	9A 216W	7.5A 210W		5.5A 220W	4.5A 216W
	HTC			50A 90W		40A 132W	30A 150W	22A 154W	13A 156W	10A 150W	6.5A 156W	5.5A 154W		4A 160W	3.2A 154W
Quarter Brick	QTC			40A 72W		30A 99W	24A 120W	17A 119W	10A 120W	8A 120W	5A 120W		4A 120W		2.5A 120W
	QGC			32A 58W		25A 83W	18A 90W	13A 91W	7.5A 90W	6A 90W	3.7A 89W		3A 90W		1.8A 86W
	QMC												2A 60W		1.2A 58W
Sixteenth Brick	SMC	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W					
	SKC	20A 24W	16A 24W	14A 25W	10A 25W	8A 26W	5A 25W	3.5A 25W	2A 24W	1.7A 26W					

IQ70	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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70Vdc Input (34-135Vdc Input Range)

Half Brick	HPC	60A 108W	57A 188W	44A 220W		20A 240W	16A 240W	10A 240W	8.5A 238W		6A 240W	5A 240W
	HTC	50A 90W	43A 142W	32A 160W		15A 180W	12A 180W	7.5A 180W	6.5A 182W		4.5A 180W	3.8A 182W
Quarter Brick	QTC	40A 72W	30A 99W	24A 120W	18A 126W	11A 132W	8.6A 129W	5.5A 132W		4.4A 132W		2.7A 130W
	QGC	32A 58W	23A 76W	17A 85W	12A 84W	7A 84W	5.5A 83W	3.5A 84W		2.8A 84W		1.8A 86W
	QMC	25A 45W	15A 50W	10A 50W	7A 49W	4A 48W	3.3A 50W	2A 48W		1.6A 48W		1A 48W



8:1 input ratio listed by package and output voltage

IQ32	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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32Vdc Input (9-75Vdc Input Range, Transient 100V)												
Half Brick	HZC			50A 250W		21A 252W	17A 255W	10A 240W	9A 252W		6A 240W	5A 240W
	HPC	55A 99W	45A 149W	32A 160W		13A 156W	11A 165W	6.7A 161W	5.8A 162W		4A 160W	3.4A 163W
	HTC	45A 81W	33A 109W	24A 120W		10A 120W	8A 120W	5A 120W	4.5A 126W		3A 120W	2.5A 120W
Quarter Brick	QTC	35A 63W	25A 83W	17A 85W	12A 84W	7A 84W	5.5A 83W	3.5A 84W		2.8A 84W		1.8A 86W
	QGC	25A 45W	15A 50W	10A 50W	7A 49W	4A 48W	3.3A 50W	2A 48W		1.6A 48W		1A 48W

IQ64	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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64Vdc Input (18-135Vdc Input Range)												
Half Brick	HPC	60A 108W	50A 165W	36A 180W		16A 192W	13A 195W	8A 192W	7A 196W		5A 200W	4A 192W
	HTC	50A 90W	40A 132W	28A 140W		12A 144W	10A 150W	6A 144W	5.5A 154W		3.8A 152W	3A 144W
Quarter Brick	QTC	36A 65W	27A 89W	20A 100W	14A 98W	8A 96W	6.5A 98W	4A 98W		3.2A 96W		2A 96W
	QGC	25A 45W	15A 50W	10A 50W	7A 49W	4A 48W	3.3A 50W	2A 48W		1.6A 48W		1A 48W

IQ90	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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90Vdc Input (34-160Vdc Input Range)												
Half Brick	HPC	60A 108W	53A 175W	40A 200W		19A 228W	15A 225W	9.5A 228W	8A 224W		5.7A 228W	4.6A 221W
	HTC	50A 90W	40A 132W	30A 150W		13A 156W	10A 150W	6.5A 156W	5.7A 160W		4A 160W	3.2A 154W
Quarter Brick	QTC	40A 72W	30A 99W	24A 120W	17A 119W	10A 120W	8A 120W	5A 120W		4A 120W		2.5A 120W
	QGC	32A 58W	23A 76W	17A 86W	12A 84W	7A 84W	5.5A 83W	3.5A 84W		2.8A 84W		1.8A 86W
	QMC	25A 45W	15A 50W	10A 49W	7A 49W	4A 48W	3.3A 50W	2A 48W		1.6A 48W		1A 48W

12:1 input ratio listed by package and output voltage

IQ68	Series	1.8V	3.3V	5V	7V	12V	15V	24V	28V	30V	40V	48V
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68Vdc Input (12-150Vdc Input Range, Transient 170V)												
Half Brick	HGC			10.6A 50W		4.4A 53W		2.2A 53W				1.1A 53W
Quarter Brick	QMC			5A 25W		2.2A 26W		1.1A 26W				0.55A 26W



Medical Grade DC-DC Power Supplies

MEDICAL GRADE DC-DC CONVERTERS RATED FOR CF PATIENT CONTACT AND DEFIBRILLATION PROOF

The CFQor series of Quarter-Brick DC-DC converters are high efficiency converters designed for those medical applications that require isolation and leakage current levels that comply with IEC60601-1 for CF patient contact and are also defibrillation proof.

PRODUCT FEATURES

- High Efficiency, up to 93% at full rated load current
- Industry standard quarter-brick pin-out configuration
- Reinforced Insulation
- 4250V, 100MΩ input-to-output
- UL 60601-1:2003
- CAN/CSA C22.2 No. 601.1-M90
- IEC 60601-1/A2:1995
- EN 60601-1/A2:1995
- CF Patient Contact
- Defibrillation Proof

CFQor	Series	5V	12V	15V	24V
12Vdc Nominal Input (9-22V Continuous Input Range; 9-25V transient)					
Quarter Brick	CF12	20A 100W	8A 96W	7A 105W	4A 96W
24Vdc Nominal Input (18-36V Continuous Input Range; 18-50V transient)					
Quarter Brick	CF24	24A 120W	10A 120W	8A 120W	5A 120W
48Vdc Nominal Input (34-75V Continuous Input Range; 34-135V transient)					
Quarter Brick	CF48	25A 125W	12A 144W	10A 150W	6A 144W

CFQor PART NUMBERING GUIDE

Product Family	Cont. Input Voltage	Output Voltage	Package Size	Performance Series	Thermal Design	Maximum Output Current	Options Description		
							Enable Logic	Pin Length	Features
CF	12: 9-22V 24: 18-36V 48: 34-75V	050: 5V 120: 12V 150: 15V 240: 24V	Q: Quarter Brick	T: Tera	C: Encased V: Flanged Baseplate	25: 25A 08: 8A 24: 24A 07: 7A 20: 20A 06: 6A 12: 12A 05: 5A 10: 10A 04: 4A	N: Negative Logic	R: 0.180"	S: Standard Features

Part Numbering Example: CF24120QTC10NRS * For valid part numbers, refer to the website or contact your local sales representative or distributor.

See pages Package-43-44 for package outlines

Mil-COTS



Isolated DC-DC Converters



MilQor[®]

“OFF-THE-SHELF” DC-DC CONVERTERS FOR MILITARY/AEROSPACE COST SENSITIVE APPLICATIONS

The MilQor series of Mil-COTS 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.

PRODUCT FEATURES

OPERATIONAL

- High efficiency, up to 93% at full rated load current
- Operating input voltage range: 9-75V, 155-425V
- Fixed frequency switching provides predictable EMI
- Switching frequency: 240 - 350kHz, 450 - 550kHz
- No minimum load requirement
- Rugged design for harsh environments
- Full Feature optional on some models

MECHANICAL

- Industry standard pin-out configurations
- Flanged baseplate available
- Industry standard footprints:
 - Full Brick: 2.48" x 4.69"
 - Half Brick: 2.39" x 2.49"
 - Quarter Brick: 1.54" x 2.39"
 - Sixteenth Brick: 1.04" x 1.44"

CONTROL

- On/Off control referenced to input side
- Remote sense for the output voltage
- Output voltage trim range of +10% to -20%
 - (Sixteenth Brick +10% to -10%)
 - (Half-Brick Zeta +10% to -50%)

PROTECTION

- Input under-voltage lockout
- Output current limit and short circuit protection
- Active back bias limit
- Output over-voltage protection
- Thermal shutdown

IN-LINE MANUFACTURING PROCESS

- AS9100 and ISO 9001:2000 certified facility
- Full component traceability
- Temperature cycling
- 12 or 96 hour burn-in
- Two level temperature screening

SAFETY

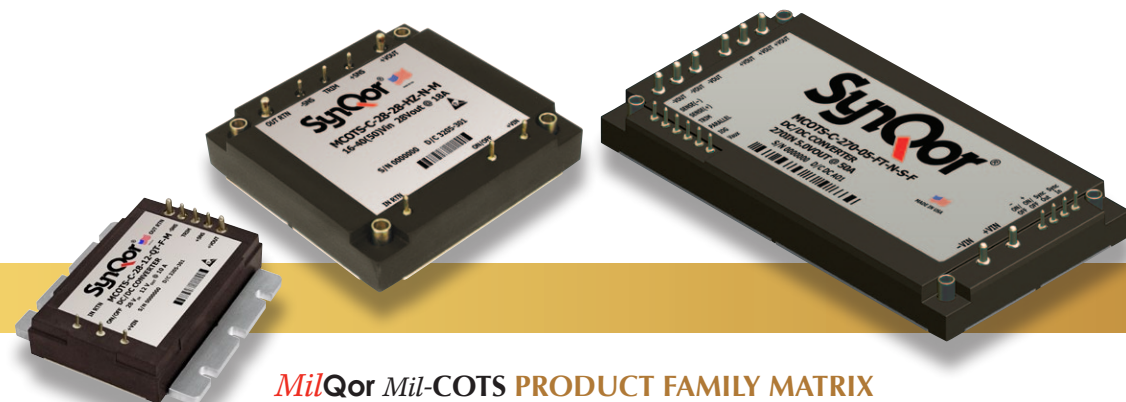
Mil-COTS 28, 28E, 28V, 28VE and 48

- Basic Insulation
- 2250V, 30M Ω input-to-output isolation
- EN 60950-1:2006/A11:2009/A1:2010
- UL 60950-1:2007
- CAN/CSA C22.2 NO. 60950-1:2007

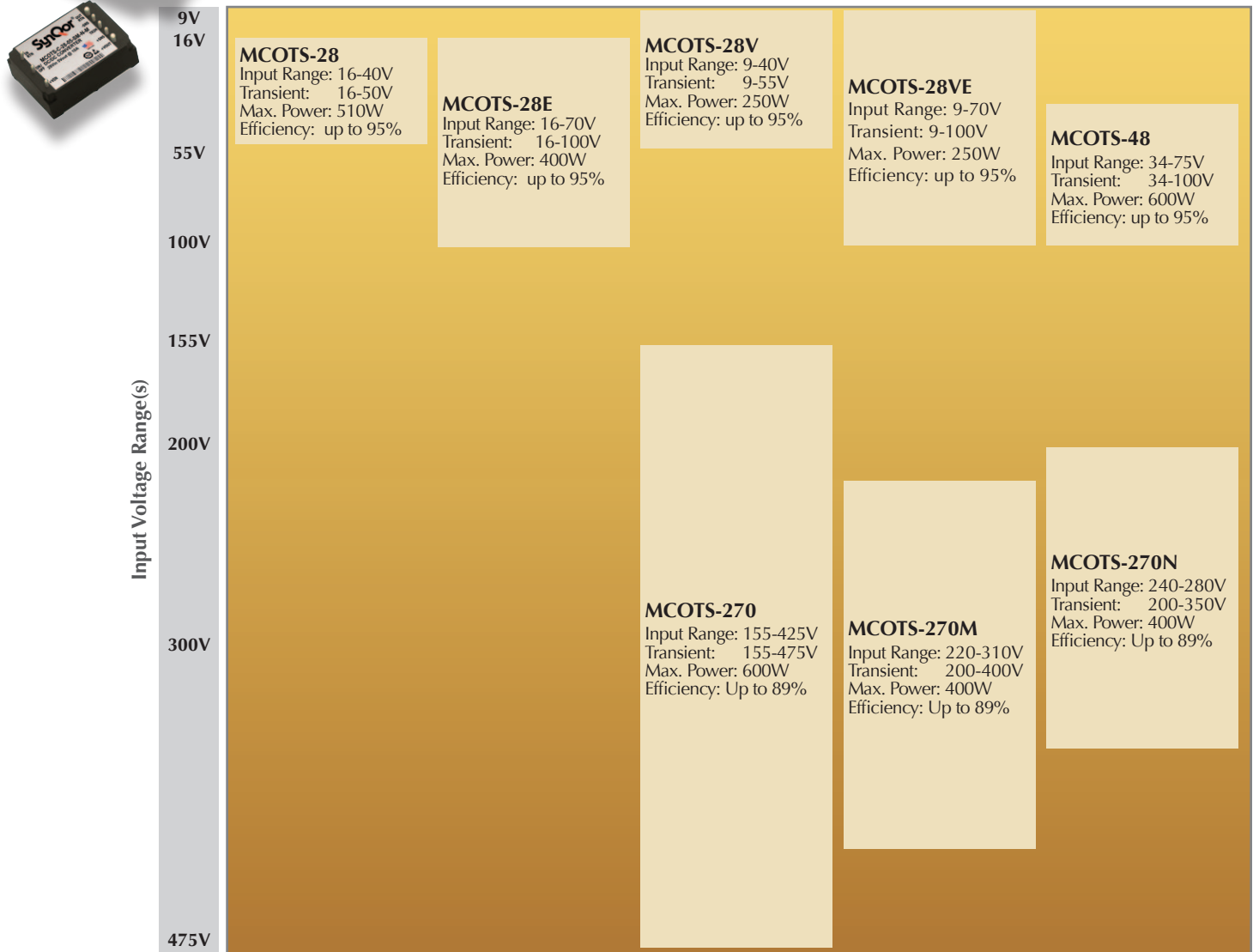
Mil-COTS 270

- Reinforced Insulation
- 4250V, 100M Ω input-to-output isolation
- EN 60950-1:2006/A11:2009/A1:2010
- UL 60950-1:2007
- CAN/CSA C22.2 NO. 60950-1:2007
- CE Marked

See pages Package-43-44 for package outlines



MilQor Mil-COTS PRODUCT FAMILY MATRIX



MilQor Mil-COTS PART NUMBERING

Product Family	Product	Cont. Input Voltage	Output Voltage		Package Size/ Pin Configuration	Heatsink Option	Screening Level	Options
MCOTS	C: Converter	28: 16-40V 28E: 16-70V 28V: 9-40V 28VE: 9-70V 48: 34-75V 270: 155-425V 270N: 240-280V 270M: 220-310V	1R2: 1.2V 1R5: 1.5V 1R8: 1.8V 2R5: 2.5V 3R3: 3.3V 05: 5V 07: 7V 7R5: 7.5V	08: 8V 12: 12V 15: 15V 24: 24V 28: 28V 36: 36V 40: 40V 48: 48V 50: 50V	FT: Full Brick (Tera) HZ: Half Brick (Zeta) HP: Half Brick (Peta) HT: Half Brick (Tera) QT: Quarter Brick (Tera) SM: Sixteenth Brick (Mega)	N: Normal D: Non-Threaded Inserts F: Flanged	S: S-Grade M: M-Grade	F: Full Feature

Part Numbering Example: MCOTS-C-28-12-HP-F-M

For valid part numbers, refer to the website or contact your local sales representative or distributor.



Isolated DC-DC Converters



MCOTS-28	Brick Size	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	7.5V	12V	15V	24V	28V	40V	48V	50V
16-40Vin Cont. 50Vin 1s Trans.* Absolute Max Vin = 60V	1/2 Zeta						60A 300W			42A 504W	34A 510W	21A 504W	18A 504W	12.5A 500W		10A 500W
	1/2 Peta			60A 108W		50A 165W	40A 200W		27A 202W	16A 192W	13A 195W	8.33A 200W	7A 196W	5A 200W	4A 192W	
	1/4	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	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W		4A 48W						

MCOTS-28E	Brick Size	1.5V	1.8V	2.5V	3.3V	5V	7V	7.5V	12V	15V	24V	28V	40V	48V	50V
16-70Vin Cont. 100Vin 1s Trans.* Absolute Max Vin = 100V	1/2 Zeta					60A 300W			33A 396W	26A 390W	16A 384W	14A 392W	10A 400W		8A 400W
	1/2 Peta		60A 108W		50A 165W	36A 180W		24A 180W	15A 180W	12A 180W	7.5A 180W	6.5A 182W	4.5A 180W	3.7A 178W	
	1/4				30A 99W	24A 120W			10A 120W	8A 120W		4.3A 120W		2.5A 120W	

MCOTS-28V	Brick Size	1.5V	1.8V	2.5V	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 Zeta					50A 250W			21A 252W	17A 255W	10A 240W	9A 252W	6A 240W		5A 250W
	1/2 Peta		60A 108W		50A 165W	36A 180W		24A 180W	15A 180W	12A 180W	7.5A 180W	6.5A 182W	4.5A 180W	3.7A 178W	
	1/4		35A 63W		25A 83W	17A 85W	12A 84W		7A 84W	5.5A 83W	3.5A 84W	2.8A 78W		1.8A 86W	

MCOTS-28VE	Brick Size	1.5V	1.8V	2.5V	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 Zeta					50A 250W			21A 252W	17A 255W	10A 240W	9A 252W	6A 240W		5A 250W
	1/2 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				25A 83W	17A 85W	12A 84W		7A 84W	5.5A 83W	3.5A 84W	2.8A 78W		1.8A 86W	

MCOTS-48	Brick Size	1.2V	1.5V	1.8V	2.5V	3.3V	5V	7V	12V	15V	24V	28V	40V	48V	50V
34-75Vin Cont. 100Vin 1s Trans.* Absolute Max Vin = 100V	1/2 Zeta						60A 300W		50A 600W	40A 600W	25A 600W	21.5A 602W	15A 600W		12A 600W
	1/2 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	40A 48W	40A 60W	40A 72W	40A 100W	30A 99W	25A 125W	20A 140W	12A 144W	10A 150W	6A 144W	5A 140W	3A 120W	3A 144W	
	1/16	25A 30W	25A 38W	25A 45W	20A 50W	15A 50W	10A 50W	7A 49W	4A 48W	3A 45W					

* Converters may be operated continuously at the highest transient input voltage, but some component electrical and thermal stresses would be beyond MIL-HDBK-1547A guidelines.



Isolated DC-DC Converters

Mil-COTS

MCOTS-270	Brick Size	1.8V	2.5V	3.3V	5V	8V	12V	15V	24V	28V	48V
155-425Vin Cont.	Full				80A 400W		50A 600W	40A 600W	25A 600W	21.4A 600W	12.5A 600W
475Vin 1s Trans.*	1/2	70A 126W	70A 175W	60A 198W	50A 250W	37.5A 300W	25A 300W	20A 300W	12.5A 300W	10.7A 300W	6.2A 300W
Absolute Max Vin = 600V	1/4	30A 54W	30A 75W	30A 99W	30A 150W		13A 156W	10A 150W	6.25A 150W	5.35A 150W	3.12A 150W



* Converters may be operated continuously at the highest transient input voltage, but some component electrical and thermal stresses would be beyond MIL-HDBK-1547A guidelines.

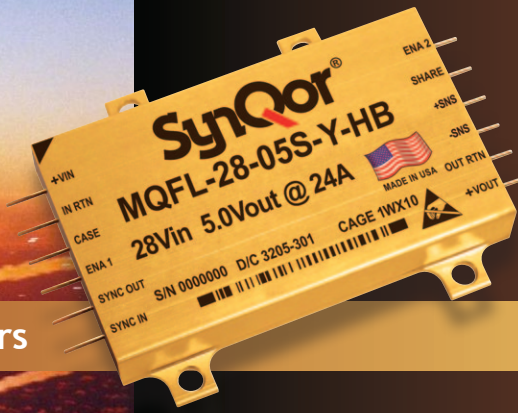
Mil-COTS Screening

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	Method 1010, Condition B, 10 Cycles	N/A	■
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-2008	■	■

Mil-COTS Qualification

Test Name	Details	# Tested (# Failed)	Consistent with MIL-STD-883F Method	Consistent with MIL-STD-883F Method 5005
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, 85%RH, 1000 hours, 2 minutes on 6 hours off	8 (0)	Method 1004.7	—
Temperature Cycling	500 cycles of -40°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)	—	—

Hi-Rel



Isolated DC-DC Converters

MilQor

HIGH-RELIABILITY, FIELD PROVEN DC-DC CONVERTERS FOR MILITARY/AEROSPACE APPLICATIONS

The MilQor series of high-reliability DC-DC converters brings SynQor's field proven high-efficiency synchronous rectifier technology to the Military/Aerospace industry. SynQor's innovative QorSeal™ packaging approach ensures survivability in the most hostile environments. Compatible with the industry standard format, these converters operate at a fixed frequency, have no opto-isolators, and follow conservative component derating guidelines.

PRODUCT FEATURES

OPERATIONAL

- Fixed switching frequency
- No opto-isolators
- Parallel operation with current share on MQFL
- Remote sense
- Clock synchronization
- Primary referenced enable
- Secondary referenced enable on MQFL
- Continuous short circuit and overload protection with auto-restart feature
- Input under-voltage and over-voltage shutdown
- Output voltage trim range (MQHL, MQHR & MQBL) +10% to -10%

DESIGN PROCESS

Hi-Rel series converters are:

- Designed for reliability per NAVSO-P3641-A guidelines
- Designed with components derated per:
 - MIL-HDBK-1547A
 - NAVSO P-3641A

MECHANICAL

- QorSeal packaging
- Industry standard footprint for MQFL & MQME
- Multiple mounting configurations & lead form options
- Gold plated nickel barrier finish on an extruded aluminium case

IN-LINE MANUFACTURING PROCESS

- AS9100 and ISO 9001:2000 certified facility
- Full component traceability
- Temperature cycling
- Constant acceleration screening
- 24, 96, 160 hour burn-in
- Three level temperature screening

QUALIFICATION PROCESS

Hi-Rel series converters are qualified to:

- MIL-STD-810
 - consistent with RTCA/DO-160
- SynQor's First Article Qualification
 - consistent with MIL-STD-883
- SynQor's Long-Term Storage Survivability Qualification
- SynQor's on-going life test
- SynQor's element evaluation for HB & ES Grade

SPECIFICATION COMPLIANCE

Hi-Rel series converters (with Hi-Rel filter) are designed to meet:

- MIL-HDBK-704
- RTCA/DO-160 Section 16
- MIL-STD-1275
- DEF-STAN 61-5 (Part 6)/6
- MIL-STD-461
- RTCA/DO-160 Section 22

See pages Package-45-46 for package outlines



Hi-Rel

MilQor Hi-Rel PRODUCT FAMILY MATRIX

Input Voltage Range(s)	5.5V				
	16V	28 Series Input Range: 16-40V Transient: 16-50V Max. Power: 120W Efficiency: 91%	28E Series Input Range: 16-70V Transient: 16-80V Max. Power: 120W Efficiency: 90%	28V Series Input Range: 16-40V Transient: 5.5-50V Max. Power: 100W Efficiency: 90%	28VE Series Input Range: 16-70V Transient: 5.5-80V Max. Power: 100W Efficiency: 90%
	50V				
	80V				
	155V			270 Series Input Range: 155-400V Transient: 155-475V Max. Power: 120W Efficiency: 88%	270L Series Input Range: 65-350V Transient: 65-475V Max. Power: 75W Efficiency: 86%
	475V				

MilQor Hi-Rel PART NUMBERING

Product Family	System Input Voltage (with transients)	Output Voltage(s)		Package Size/ Pin Configuration	Screening Grade
		Single Output	Dual Output		
MQFL MQHL MQHR MQBL	28: 16-40V (16-50V) 28E: 16-70V (16-80V) 28V: 16-40V (5.5-50V) 28VE: 16-70V (5.5-80V) 270: 155-400V (155-475V) 270L: 65-350V (65-475V)	1R5S: 1.5V 1R8S: 1.8V 2R5S: 2.5V 3R3S: 3.3V 05S: 5V 06S: 6V 7R5S: 7.5V 09S: 9V 12S: 12V 15S: 15V 28S: 28V	05D: ±5V 12D: ±12V 15D: ±15V	U X Y W Z (FL, HL, HR) S F (BL)	C ES HB
Product Family	Nominal System Input Voltage (with transients)	Nominal Output Voltage(s)		Package Size/ Pin Configuration	Screening Grade
MQBQ	28: 16-40V (16-50V) 270: 230-400V (155-450V)	28B: (1:1) 28B: (9:1)		U X Y W Z	C ES HB

Part Numbering Example: MQHL-28-05S-Y-HB

For valid part numbers, refer to the website or contact your local sales representative or distributor.



Hi-Rel

Isolated DC-DC Converters

Hi-Rel Full Size Package (MQFL)

Single Output

Dual Output†

Product Family	1.5V	1.8V	2.5V	3.3V	5V	6V	7.5V	9V	12V	15V	28V	±5V	±12V	±15V
	1R5S	1R8S	2R5S	3R3S	05S	06S	7R5S	09S	12S	15S	28S	05D	12D	15D
MQFL-28 (120W) 16-40Vin Cont. 16-50Vin 1s Trans. * Absolute Max Vin = 60V	40A 60W	40A 72W	40A 100W	30A 100W	24A 120W	20A 120W	16A 120W	13A 117W	10A 120W	8A 120W	4A 112W	24A 120W Total	10A 120W Total	8A 120W Total
MQFL-28E (120W) 16-70Vin Cont. 16-80Vin 1s Trans. * Absolute Max Vin =100V	40A 60W	40A 72W	40A 100W	30A 100W	24A 120W	20A 120W	16A 120W	13A 117W	10A 120W	8A 120W	4A 112W	24A 120W Total	10A 120W Total	8A 120W Total
MQFL-28V (100W) 16-40Vin Cont. 5.5-50Vin 1s Trans. * Absolute Max Vin = 60V	40A 60W	40A 72W	40A 100W	30A 100W	20A 100W	17A 102W	13A 98W	11A 99W	8A 96W	6.5A 98W	3.3A 92W	20A 100W Total	8A 96W Total	6.5A 98W Total
MQFL-28VE (100W) 16-70Vin Cont. 5.5-80Vin 1s Trans. * Absolute Max Vin = 100V	40A 60W	40A 72W	40A 100W	30A 100W	20A 100W	17A 102W	13A 98W	11A 99W	8A 96W	6.5A 98W	3.3A 92W	20A 100W Total	8A 96W Total	6.5A 98W Total
MQFL-270 (120W) 155-400Vin Cont. 155-475Vin 1s Trans. * Absolute Max Vin = 550V	40A 60W	40A 72W	40A 100W	30A 100W	24A 120W	20A 120W	16A 120W	13A 117W	10A 120W	8A 120W	4A 112W	24A 120W Total	10A 120W Total	8A 120W Total
MQFL-270L (75W) 65-350Vin Cont. 65-475Vin 1s Trans. * Absolute Max Vin = 550V	40A 60W	40A 72W	30A 75W	22A 72.6W	15A 75W	12A 72W	10A 75W	8A 72W	6A 72W	5A 75W	2.7A 75W	15A 75W Total	6A 72W Total	5A 75W Total

Hi-Rel Half Size Packages (MQHL – MQHR)

Single Output

Dual Output†

Product Family	1.5V	1.8V	2.5V	3.3V	5V	6V	7.5V	9V	12V	15V	28V	±5V	±12V	±15V
	1R5S	1R8S	2R5S	3R3S	05S	06S	7R5S	09S	12S	15S	28S	05D	12D	15D
MQHL-28 (50W) 16-40Vin Cont. 16-50Vin 1s Trans. Absolute Max Vin = 60V	20A 30W	20A 36W	20A 50W	15A 50W	10A 50W	8A 48W	6.6A 50W	5.5A 50W	4A 48W	3.3A 50W	1.8A 50W	10A 50W Total	4A 48W Total	3.3A 50W Total
MQHL-28E (50W) 16-70Vin Cont. 16-80Vin 1s Trans. * Absolute Max Vin =100V	20A 30W	20A 36W	20A 50W	15A 50W	10A 50W	8A 48W	6.6A 50W	5.5A 50W	4A 48W	3.3A 50W	1.8A 50W	10A 50W Total	4A 48W Total	3.3A 50W Total
MQHR-28 (25W) 16-40Vin Cont. 16-50Vin 1s Trans. * Absolute Max Vin = 60V	10A 15W	10A 18W	10A 25W	7.5A 25W	5A 25W	4A 24W	3.3A 25W	2.75A 25W	2A 24W	1.65A 25W	0.9A 25W	5A 25W Total	2A 24W Total	1.65A 25W Total
MQHR-28E (25W) 16-70Vin Cont. 16-80Vin 1s Trans. * Absolute Max Vin =100V	10A 15W	10A 18W	10A 25W	7.5A 25W	5A 25W	4A 24W	3.3A 25W	2.75A 25W	2A 24W	1.65A 25W	0.9A 25W	5A 25W Total	2A 24W Total	1.65A 25W Total

* Converters may be operated continuously at the highest transient input voltage, but some component electrical and thermal stresses would be beyond MIL-HDBK-1547A guidelines.

† 80% of total output available on any one output.

Hi-Rel Bottom Pin Packages (MQBL)

Product Family	Single Output											Dual Output†		
	1.5V 1R5S	1.8V 1R8S	2.5V 2R5S	3.3V 3R3S	5V 05S	6V 06S	7.5V 7R5S	9V 09S	12V 12S	15V 15S	28V 28S	±5V 05D	±12V 12D	±15V 15D
MQBL-28 (20W) 16-40Vin Cont. 16-50Vin 1s Trans. * Absolute Max Vin = 60V	8A 12W	8A 14.4W	8A 20W	6A 19.8W	4A 20W	3.3A 19.8W	2.6A 19.5W	2.2A 19.8W	1.6A 19.2W	1.3A 19.5W	0.7A 19.6W	4A 20W Total	1.6A 19.2W Total	1.3A 19.5W Total
MQBL-28E (20W) 16-70Vin Cont. 16-80Vin 1s Trans. * Absolute Max Vin =100V	8A 12W	8A 14.4W	8A 20W	6A 19.8W	4A 20W	3.3A 19.8W	2.6A 19.5W	2.2A 19.8W	1.6A 19.2W	1.3A 19.5W	0.7A 19.6W	4A 20W Total	1.6A 19.2W Total	1.3A 19.5W Total

* Converters may be operated continuously at the highest transient input voltage, but some component electrical and thermal stresses would be beyond MIL-HDBK-1547A guidelines.

† 80% of total output available on any one output.

Hi-Rel Bus Converter (MQBQ)

*See Product Datasheets

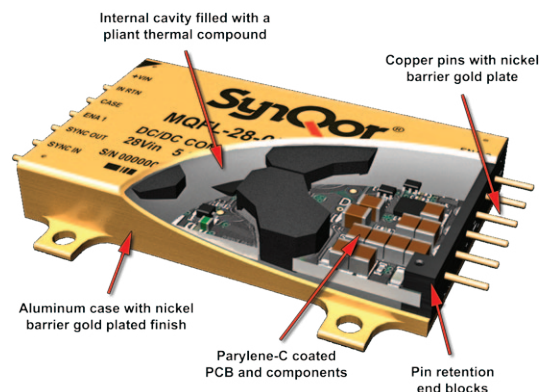
Hi-Rel Screening

Screening	Consistent with MIL-STD-883	C-Grade (-40°C to +100°C)	ES-Grade (-55°C to +125°C) Element Evaluation	HB-Grade (-55°C to +125°C) Element Evaluation
Internal Visual	•	Yes	Yes	Yes
Temperature Cycle	Method 1010	No	Condition B (-55°C to +125°C)	Condition C (-65°C to +150°C)
Constant Acc.	Method 2001 (Y1 direction)	No	500g	Condition A (5000g)
Burn-In Method 1015 Load Cycled	-10s period -2s 100% load -8s 0% load	24hrs @ +125°C	96hrs @ +125°C	160hrs @ +125°C
Final Electrical Test	Method 5005 (Group A)	+25°C	-45°C, +25°C, +100°C	-55°C, +25°C, +125°C
Packaging		QorSeal	QorSeal	QorSeal
External Visual	2009	•	Yes	Yes
Construction		QorSeal	QorSeal	QorSeal

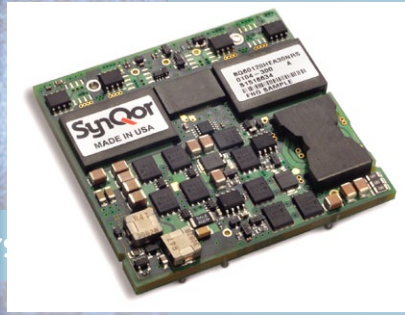
• Per IPC-A-610 Class 3

QorSeal Packaging

Our unique QorSeal™ packaging approach provides a conduction-cooled mechanical assembly around an SMT constructed power circuit that is low-profile, light-weight, and shielded. This process provides three levels of Tin Whisker mitigation.



Isolated Bus Converters



OPEN-FRAME, HIGH EFFICIENCY NEXT GENERATION DC-DC BUS CONVERTERS

The BusQor bus converters are the next-generation, board-mountable, isolated, fixed switching frequency DC-DC converters that uses synchronous rectification to achieve extremely high conversion efficiency. The power dissipated by the converter is so low that a heatsink is not required, which saves cost, weight, height, and application effort. BusQor converters are ideal for creating the mid-bus voltage required to drive point-of-load (non-isolated) converters in IBA.

PRODUCT FEATURES

OPERATIONAL

- Ultra-high efficiency up to 96%
- Wide input voltage ranges:
 - 42V - 53V (BQ50)
 - 35V - 55V (BQ55)
 - 35V - 75V (BQ60, PQ60)
 - 36V - 75V (SQ60)
- Delivers 6.0V, 9.6V or 12V bus for Intermediate Bus Architectures (IBA)

GENERAL SPECIFICATIONS

- Operating Temperature -40°C to +100°C
- Output Voltage Ripple <0.3% of V_{out} (typ.)
- Input Ref. Ripple Current <5% of I_{in} (typ.)
- Transient Response ± 50 - 200mV
- Current Share Accuracy $\pm 10\%$
- Isolation Voltage Up to 2250Vdc

PROTECTION/CONTROL

- Input under-voltage lockout (UVLO)
- Output current limit (OCP) and short circuit protection
- Output over-voltage protection (OVP)
- Thermal shutdown (OTP)
- Back-drive protection (starts into pre-biased load)
- On/Off control referenced to input side
- Remote sense
- Output voltage trim on select models

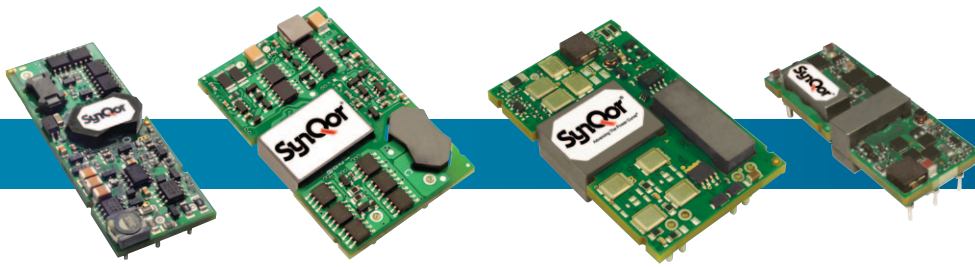
MECHANICAL

- Industry standard pin-out configurations
- Industry standard footprints:
 - Eighth Brick: 0.90" x 2.3"
 - Quarter Brick: 1.45" x 2.3"
 - Half Brick: 2.3" x 2.4"
- Open-frame, single board construction for higher reliability (baseplated versions also available)

SAFETY

- Up to 2250Vdc, 30M Ω input-to-output isolation
- Basic insulation rating
- EN 60950-1:2006/A11:2009/A1:2010
- UL 60950-1:2007
- CAN/CSA C22.2 NO. 60950-1:2007
- Meets UL94V-0 flammability requirements

See pages Package-41-42 for package outlines



BusQor PRODUCT FAMILY MATRIX

	UN-REGULATED	SEMI-REGULATED	FULLY-REGULATED
35V			
42V	BQ50 Input Range: 42-53V Max. Power: 331W Efficiency: 96.5%		
55V	BQ55 Input Range: 35-55V Max. Power: 600W Efficiency: 96%	SQ60 Input Range: 36-75V Transient 100V Max. Power: 600W Efficiency: 95%	BQ60 & PQ60 Input Range: 35-75V Transient 100V Max. Power: 600W Efficiency: 95%
100V			

BusQor PART NUMBERING

Base Part Number							Option Description		
Product Family	Input Voltage	Output Voltage	Package Size	Performance Series	Thermal Design	Max. Output Current	Enable Logic	Pin Length	Features
BQ SQ PQ	50: 42-53V 55: 35-55V 60: 35-75V	060: 6V 090: 9.6V 120: 12V	E: Eighth Brick Q: Quarter Brick H: Half Brick	T: Tera P: Peta E: Exa Z: Zeta	A: Open-frame B: Baseplated C: Encased	16: 16A 17: 17A 20: 20A 25: 25A (not all currents shown)	P: Pos. N: Neg.	K: 0.110" N: 0.145" R: 0.180" Y: 0.250"	S: Standard C: No common mode capacitor 2: Two sets of output pins

Part Numbering Example: BQ55090QTA27NRS *For valid part numbers, refer to the website or contact your local sales representative or distributor

BusQor listed by Package and output voltage

BQ55	Series	9.6V	12V
48Vdc Input (35-55Vdc Input Range)			
Quarter Brick	QEA	60A 390-630W	50A 412-662W
	QPA	43A 300-473W	
	QTA	240W** 22-36A	
Eighth Brick	EZA		40A 330-530W
	ETA	27A 189-297W	20A 175-275W
	ETL		16A 140-220W

SQ60	Series	6V	12V
48Vdc Input (36-75Vdc Input Range, Transient 100Vdc)			
Half Brick	HZA		50A 600W
Quarter Brick	QZA		40A 480W
	QPB		33A 396W
	QPA	55A 330W	28A 336W
Eighth Brick	QEA		25A 300W
	ETA		17A 204W
	ETA		20A 240W

BQ50	Series	12V
48Vdc Input (42-53Vdc Input Range)		
Quarter Brick	QTA	20A 210-265W
	QTA	25A 263-331W
BQ60/PQ60		
Series 12V		
48Vdc Input (35-75Vdc Input Range, Transient 100Vdc)		
Half Brick	HZA	50A 600W
	HEA	30A 360W
Quarter Brick	QEA	25A 300W
	QEA	17A 204W

** BQ55090QTA27 is power limited @ 240W over Input Voltage Range



Non-Isolated DC-DC Converters

Hi-Voltage

HIGH VOLTAGE, NON-ISOLATED DC-DC CONVERTERS FOR INDUSTRIAL APPLICATIONS

The high input voltage NiQor family of DC-DC converters offers 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 IBA, 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 using a single external resistor.

PRODUCT FEATURES

OPERATIONAL

- Ultra-high efficiency up to 95%
- Wide input voltage ranges:
9-20V (NQ20); 9-40V (NQ40); 9-60V (NQ60); 9-100V (NQ1A)
- Buck or Buck/Boost Mode available
- Maximum input/output currents up to 80A
- Suitable for use in Intermediate Bus Architectures
- On-board input and output filtering
- No minimum load requirement
- Remote sense and wide output voltage trim

SAFETY

- UL/cUL 60950-1 recognized (US and Canada)
- TUV certified to EN60950-1 for all participating countries
- Meets UL94V-0 flammability requirements

MECHANICAL

- Industry standard pin-out configurations
- Industry standard footprints:
 - Eighth Brick: 0.99" x 2.39" x 0.50"
 - Quarter Brick: 1.54" x 2.39" x 0.50"
 - Half Brick: 2.49" x 2.39" x 0.51"

PROTECTION/CONTROL

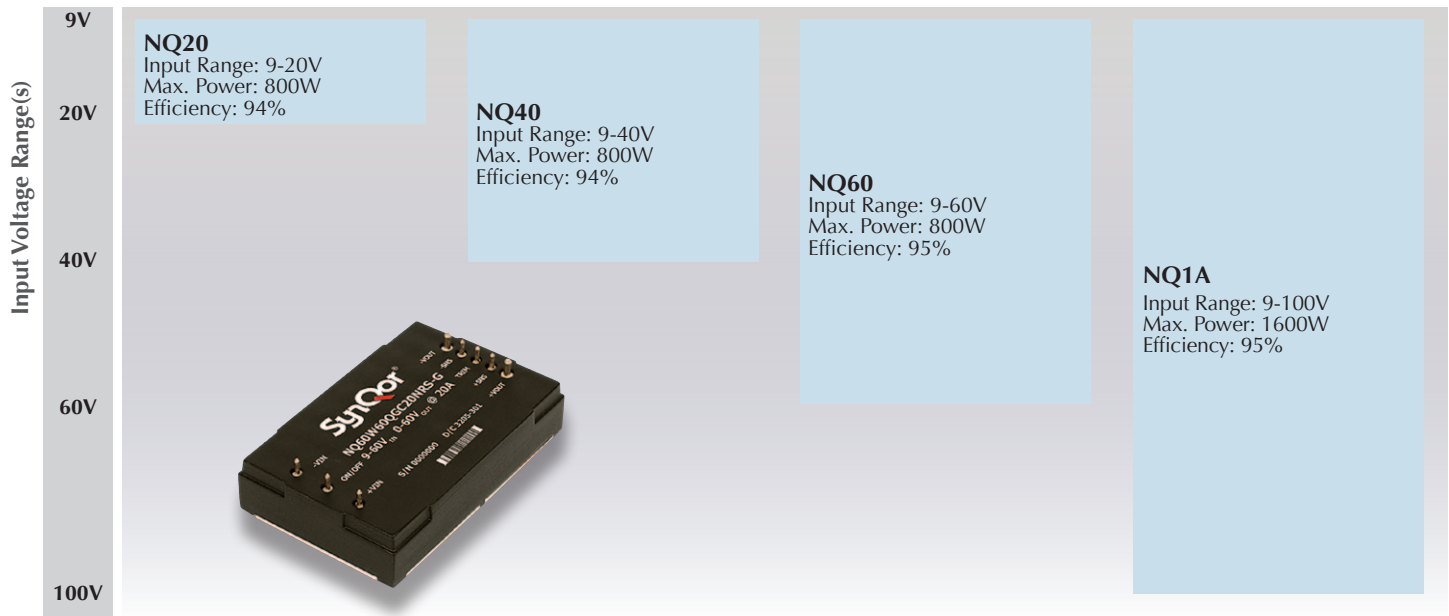
- Input under-voltage lockout (UVLO)
- Output current limit (OCP) and short circuit protection
- Output over-voltage protection (OVP)
- Thermal shutdown (OTP)
- Output voltage trim

BATTERY CHARGING (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 charge

See page Package-43 for package outlines

NiQor Hi-Voltage PRODUCT FAMILY MATRIX



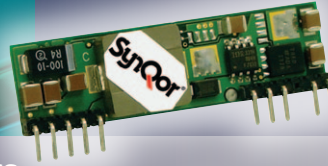
NiQor Hi-Voltage PART NUMBERING

Product Family	Input Voltage	Mode	Output Voltage	Package Size	Performance Series	Thermal Design	Maximum Current	Options Description:		
								Enable Logic	Pin Length	Feature Set
NQ	20: 9-20V 40: 9-40V 60: 9-60V 1A: 9-100V	T: Buck W: Buck/Boost	20: 0-20V 40: 0-40V 60: 0-60V 1A: 0-100V	E: Eighth Brick Q: Quarter Brick H: Half Brick	G: Giga T: Tera	C: Encased D: Encased Non-threaded Baseplate V: Encased Flanged Baseplate	05: 5A 08: 8A 10: 10A 15: 15A 20: 20A 24: 24A 30: 30A 40: 40A 60: 60A 80: 80A	N: Neg.	K: 0.110" N: 0.145" R: 0.180" Y: 0.250"	S: Standard C: Current monitor output/ trimmable current limit F: Current share/ trimmable current limit (half brick only)

Part Numbering Example: NQ20W20ETC20NRS *For valid part numbers, refer to the website or contact your local sales representative or distributor.

NiQor Hi-Voltage listed by Package and output voltage

NQ20	Series	0-20V	NQ40	Series	0-40V	NQ60	Series	0-60V	NQ1A	Series	0-100V
9-20Vdc Input Range			9-40Vdc Input Range			9-60Vdc Input Range			9-100Vdc Input Range		
Half Brick	HG	80A	Half Brick	HG	60A	Half Brick	HG	40A	Half Brick	HG	24A
Quarter Brick	QG	40A	Quarter Brick	QG	30A	Quarter Brick	QG	20A			
Eighth Brick	ET	20A	Eighth Brick	ET	15A	Eighth Brick	ET	10A			
	EG	10A		EG	8A		EG	5A			



Non-Isolated DC-DC Converters

NON-ISOLATED, ULTRA-HIGH EFFICIENCY DC-DC CONVERTERS FOR TELECOM, INDUSTRIAL AND MEDICAL APPLICATIONS

The NiQor DC-DC converter is a non-isolated buck regulator, which employs synchronous rectification to achieve extremely high conversion efficiency. The NiQor family of converters are used predominately in DPA systems using a front end DC-DC high power brick (48Vin to low voltage bus). The non-isolated NiQor converters are then used at the point of load to create the low voltage outputs required by the design. The wide trim module can be programmed to a variety of output voltages through the use of a single external resistor.

PRODUCT FEATURES

OPERATIONAL

- Ultra-high efficiency up to 96%
- Wide input voltage ranges:
 - 3.0-5.5V, 2.4-6.0V (NQ04)
 - 6.0-15V (NQ15)
 - 6.0-16V (NQ16)
- Suitable for use in Intermediate Bus Architectures
- On-board input and output filtering
- No minimum load requirement
- Optional features include remote sense, wide output voltage trim, and output current sharing
- Follows DOSA standard pinout and footprint

GENERAL SPECIFICATIONS

- Operating Temperature -40°C to +105°C
- Output Voltage Set Point $\pm 0.7 - 20\%$
- Output Voltage Ripple $< 1.5\%$ of V_{out} (typ.)
- Input Ref. Ripple Current $< 5\%$ of I_{in} (typ.)
- Switching Frequency 300 - 390kHz
- Transient Response $\pm 40 - 100\text{mV}$
- Output Voltage Trim Range 0.7 - 5.5V

PROTECTION/CONTROL

- Input under-voltage lockout (UVLO)
- Output current limit (OCP) and short circuit protection
- Output over-voltage protection (OVP)
- Thermal shutdown (OTP)
- On/Off control referenced to input side
- Output voltage trim (industry std. trim equations)

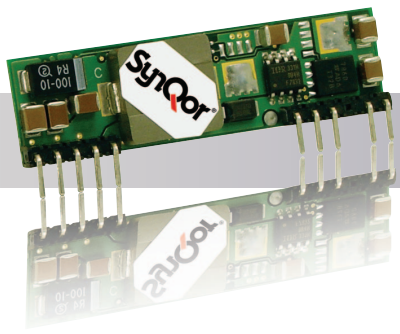
MECHANICAL

- Available in SIP (vertical and horizontal) & SMT mounting configurations
- Industry standard pin-out configurations
- Industry standard footprints:
 - SIP: 2.0" x 0.55" x 0.34"
 - SMT: 1.3" x 0.53" x 0.29"

SAFETY

- UL/cUL 60950-1 recognized (US and Canada)
- TUV certified to EN60950-1 for all participating countries
- Meets UL94V-0 flammability requirements

See page NQ-32 for package outlines.



NiQor PRODUCT FAMILY MATRIX

Input Voltage Range(s)	3V	NQ04 Input Range: 3-6V Max. Power: 58W Efficiency: 95%	
	6V	NQ15 Input Range: 6-15V Max. Power: 150W Efficiency: 95%	NQ16 Input Range: 6-16V Max. Power: 80W Efficiency: 95%
16V			

NiQor PART NUMBERING

Product Family	Input Voltage	Output Voltage	Package Type	Performance Series	Thermal Design	Maximum Current	Options Description		
							Enable Logic	Pin Style	Feature Set
NQ	04: 3-6V 15: 6-15V 16: 6-16V	W50: 0.75-5V W33: 0.75-3.6V T33: 0.85-3.6V	V: Vert. SIP H: Horiz. SIP S: Surface-Mount	K: Kilo M: Mega G: Giga	A: Open frame	07: 7A 10: 10A 15: 15A 16: 16A 30: 30A	P: Pos./Open O: Neg./Open N: Negative	R: 0.160" SIP Std V: 0.160" Rev. Vert. S: SMT Std.	N: None S: Sense D: Sense & Share G: Sense, Share & Gnd Pins

Part Numbering Example: NQ04W33SMA16PSS * For valid part numbers, refer to the website or contact your local sales representative or distributor.

NiQor listed by Package and output voltage

NQ04	Package	0.75-3.6V	0.85-3.6V
3.3, 5.0Vdc Input (2.4-6.0Vdc Input Range)			
2.4-6.0Vin	SMT	10A 36W	
		16A 58W	
3.0-5.5Vin	SIP		16A 58W
3.0-6.0Vin	SIP	10A 36W	10A 36W
		16A 58W	

NQ15, NQ16	Package	0.75-5.0V	0.8-5.0V
12Vdc Input (6.0-16Vdc Input Range)			
6.0-15Vin	SMT		30A 150W
6.0-16Vin	SIP	10A 50W	
		16A 80W	
	SMT	10A 50W	
		16A 80W	



EMI Filters



EMI FILTER MODULES FOR INQOR AND MILQOR DC-DC CONVERTERS

SynQor provides EMI filters for the InQor, MIL-COTS and Hi-Rel series DC-DC converters. All EMI filters provide >80dB differential mode attenuation and >36dB or >60dB common mode attenuation (model dependent) and include stabilizing bulk capacitors and damping resistors.

PRODUCT FEATURES

OPERATIONAL

- Low DC resistance
- >80dB differential noise attenuation @500kHz
- >50dB common-mode noise attenuation @500kHz
- Bulk capacitance provides input system stabilization for downstream power converters
- No electrolytic capacitors (all ceramic design)
- High-voltage isolation between chassis and input / output
- Wide temperature range operation

PRODUCT OPTIONS

- Input voltage ranges match available SynQor DC-DC converters
- Advanced control features available (*Hi-Rel* model)
 - Input surge suppression
 - Reverse polarity protection with synchronous rectifiers available
 - Enable pass-through
 - Soft-start
 - Current limit
 - Standby

MECHANICAL

- Industry standard form factors
 - *InQor* Quarter Brick: 1.54" x 2.39"
 - *Mil-COTS* Quarter Brick: 1.54" x 2.39"
 - *Mil-COTS* Half Brick: 2.39" x 2.49"
 - *Hi-Rel* Full-Size: 3.00" x 1.50"
 - *Hi-Rel* Half-Size: 1.88" x 1.50"
- Quarter and Half Brick also available with a flanged baseplate

IN-LINE MANUFACTURING PROCESS

- AS9100 and ISO 9001:2000 certified facility
- Full component traceability
- Environmental screening options available for *Mil-COTS* and *Hi-Rel* products

DESIGN PROCESS

- Designed to operate with SynQor DC-DC converters to create systems compliant with industry standards. See product datasheets for details.
- Conservative derating guidelines used for reliable operation. See product datasheets for details.

See page Package-43-46 for package outlines



InQor EMI Filters (Quarter Brick Size)

Model Number	Input Voltage			Isolation Voltage (to case)	Maximum DC Resistance @ 100°C	Differential-Mode Attenuation	Common-Mode Attenuation
	Continuous	Transient (1s)	Absolute Maximum				
IQ040PFQTC30	40V	50V	50V	2250V	20mΩ	>80dB @ 250kHz	>36dB @ 250kHz
IQ080PFQTC20	80V	100V	100V	2250V	32mΩ	>80dB @ 250kHz	>36dB @ 250kHz
IQ200PFQTC10	200V	250V	250V	2250V	70mΩ	>80dB @ 500kHz	>50dB @ 500kHz
IQ500PFQTC04	500V	630V	630V	2500V	180mΩ	>80dB @ 500kHz	>50dB @ 500kHz

Mil-COTS EMI Filters (Quarter Brick and Half Brick Size)



Model Number	Input Voltage			Isolation Voltage (to case)	Maximum DC Resistance @ 100°C	Differential-Mode Attenuation	Common-Mode Attenuation
	Continuous	Transient (1s)	Absolute Maximum				
MCOTS-F-28-T-HT	40V	50V	100V	2250V	50mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-28-P-QT	40V	50V	50V	2250V	20mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-48-P-QT	80V	100V	100V	2250V	32mΩ	>80dB @ 250kHz	>36dB @ 250kHz
MCOTS-F-270-P-QT	500V	630V	630V	2500V	180mΩ	>80dB @ 500kHz	>50dB @ 500kHz

Hi-Rel EMI Filters



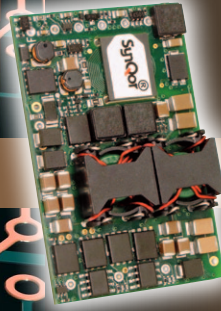
Model Number	Input Voltage			Isolation Voltage (to case)	Maximum DC Resistance @ 125°C	Differential-Mode Attenuation (@ 500kHz)	Common-Mode Attenuation (@ 500kHz)
	Continuous	Transient (1s)	Absolute Maximum				
MQME-28-P	40V	50V	100V	500V	35mΩ	>80dB	>60dB
MQME-28-T ¹	40V	50V	100V	500V	35mΩ	>80dB	>60dB
MQME-28E-P	70V	80V	100V	500V	60mΩ	>80dB	>60dB
MQME-28E-T ¹	70V	80V	100V	500V	60mΩ	>80dB	>60dB
MQME-28E-T6 ¹	70V	80V	100V	500V	60mΩ	>80dB	>60dB
MQME-270-P	400V	500V	800V	500V	1.6Ω	>80dB	>60dB
MQME-270-R ²	400V	500V	800V	500V	1.6Ω	>80dB	>60dB
MQHE-28-P	40V	50V	100V	500V	60mΩ	>80dB	>60dB
MQHE-28E-P	70V	80V	100V	500V	60mΩ	>80dB	>60dB
MQHE-270-P	400V	500V	800V	500V	500mΩ	>50dB	>60dB

Note 1 - T and T6 filters feature enable pass-through, transient suppression, soft-start and reverse polarity protection circuitry in addition to passive filter components.

Note 2 - R filters feature reverse polarity protection circuitry in addition to passive filter components.



ATCA Modules



ADVANCED TELECOMMUNICATIONS COMPUTING ARCHITECTURE (ATCA™) POWER INTERFACE MODULE

The iQor™ Power Interface Modules integrate all features required by the Advanced TCA Base Specification for a frame board power entry into a Quarter-Brick footprint. Minimal external components are required for all the key functions. The product family provides efficient utilization of hold-up capacitance. A full-feature module with I²C interface is also available.

PRODUCT FEATURES

OPERATIONAL

- 100V/1ms transient protection
- Auxiliary supply voltages:
 - 3.3V, 3.6A
 - 5.0V, 150mA
- Standard Quarter Brick package size: 1.45" x 2.3"
- Trimmable 50-95V hold-up capacitance voltage
- Optional I²C interface for feedback on:
 - A & B Feed Voltage
 - Hold-up Voltage
 - 48V_{out} Voltage & Current
 - Temperature
 - Fuse and MOSFET failure
- Random start-up delay

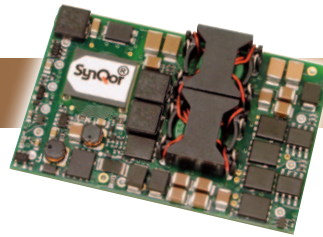
PROTECTION/CONTROL

- Inrush current limiting
- EMI filtering
- Output current limit (OCP) and short circuit protection
- Output over-voltage protection (OVP)
- Thermal shutdown (OTP)
- Hold-up capacitor discharge control

SAFETY

- Up to 2250Vdc 30M Ω input to output isolation voltage
- UL/cUL 60950-1 recognized (US & Canada)
- Basic Insulation Rating
- TUV certified to EN60950-1 for all participating countries
- Meets UL94V-0 flammability requirements

For valid part numbers, refer to the website or contact your local sales representative or distributor.

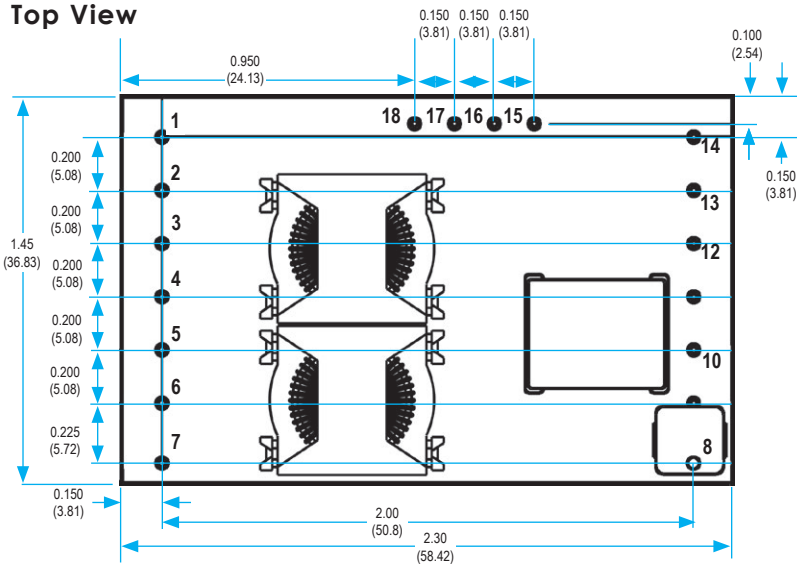


iQor PART NUMBERING

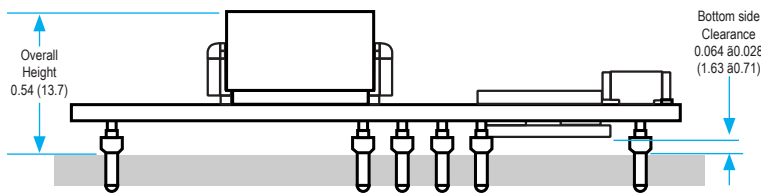
Product Family	Input Voltage	Auxiliary Output 1	Auxiliary Output 2	Package Size	Performance Series	Thermal Design	Output Current	Threshold Protocols	Pin Length	Feature Set
IQ	6	50	33	Q	M: Mega G: Giga	A	10 12	S	N	S

Threshold Protocols	Pin Length	Feature Set
S: Standard (ATCA) N: NEDS (Mega only) E: ETSI	K: 0.110" N: 0.145" R: 0.180" Y: 0.250"	S: Standard Feature F: Full Feature

Top View



Side View



Pin No.	Name	Function
1	-48V_A	Negative 48V A feed
2	-48V_B	Negative 48V B feed
3	VRTN_A	48V Return A feed
4	VRTN_B	48V Return B feed
5	ENABLE_A	Enable A feed
6	ENABLE_B	Enable B feed
7	SHELF_GND	Shelf ground
8	5.0V	+5.0V Management power
9	3.3V	+3.3V Management power
10	I2C_ADR	Address (Full feature version)
11	I2C_DAT	Data (Full feature version)
12	I2C_CLK	Clock (Full feature version)
13	LOGIC_GND	Logic ground
14	ALARM	Alarm
15	-48V_OUT	Negative 48V output
16	HU_TRIM	Hold-up voltage trim
17	VRTN_OUT	Positive 48V output
18	HU_CAP	Hold-up capacitor connect



AC-DC Power Supplies

MEDICAL AND INDUSTRIAL-GRADE HIGHLY EFFICIENT AC-DC POWER SUPPLIES WITH PFC

The ACuQor product line offers the best-in-class solutions for AC-DC power supplies designed to meet an extensive range of medical applications. Packing 500W of useable power into just 3.5" x 5.25" x 1.63", the E-Series is the world's smallest cardiac care, medical grade AC-DC converter for this power level. The G-Series provides 1400W of useable power in a 4.75" x 7" x 1.63" package. The medical grade version meets UL60601-1 medical safety specs for cardiac contact without requiring an external isolation transformer. The product is also available in an industrial grade.

PRODUCT FEATURES

GENERAL SPECIFICATIONS

- High efficiency up to 93% at full rated load current
- E-Series delivers up to 500W of output power (700W transient)
- G-Series delivers up to 1400W of output power (1800W transient)
- Semi-regulated output
- Universal 85-264V AC Input Voltage (47-63Hz)
- Single output voltages: 12V, 15V, 24V, 28V, 36V, 48V
- 5V "Always On" standby power output
- Active PFC; EN61000-3-2 compliant
- Low leakage; EN60601-1 compliant
- Low noise; EN55011 / EN55022 Class B compliant

PROTECTION/CONTROL

- Over-current, over-voltage, and over-temp protection
- DC Power Good and AC Power Good signals
- Remote enable input

SAFETY AND EMI

- Type B, BF, CF & Defibrillator proof variants available
- UL60601-1 and 60950-1
- Can/CSA-C22.2 No. 601.1-M90 and 60950-1
- EN 60601-1 and 60950-1
- CE Marked
- EN55011, 55022 and 61000

MECHANICAL

- 1U High
- Small sizes
- E-Series: 3" x 5" products
- G-Series: 4.75" x 7" products
- Operating ambient temperature 0-70°C

See pages Package-48 -49 for package outlines



E-Series



G-Series

Output	Power Rating	
	Medical Grade	Industrial Grade
E-Series (Single Output) (3" x 5" Package) 12V, 24V, 36V or 48V (includes 5V@50mA standby)	300W (400W Transient)	300W (400W Transient)
	400W (500W Transient)	400W (500W Transient)
	500W (700W Transient)	500W (700W Transient)
G-Series (Single Output) (4.75" x 7" Package) 12V, 15V, 24V, 28V, 48V (includes 5V@50mA standby)	800W (1000W Transient)	800W (1000W Transient)
	1100W (1300W Transient)	1100W (1300W Transient)
	1400W (1800W Transient)	1400W (1800W Transient)
E-Series (Triple Output) (3" x 5" Package) 12V, 24V, 36V or 48V (includes 5V@2A and 12V@4.2A)	300W (400W Transient)	300W (400W Transient)
	400W (500W Transient)	400W (500W Transient)
	500W (700W Transient)	500W (700W Transient)

ACuQor PART NUMBERING

Product Family	Output Power	Grade	Range	Output Voltage	Package Size	Thermal Design	Options
AQ	0300: 300W 0400: 400W 0500: 500W 0600: 600W 0800: 800W 0900: 900W 1000: 1000W 1100: 1100W 1200: 1200W 1400: 1400W 1500: 1500W	I: Industrial M: Medical	U: Universal (85-264VRMS)	12: 12V 1T: 12V/12V/5V 15: 15V 24: 24V 2T: 24V/12V/5V 28: 28V 36: 36V 3T: 36V/12V/5V 48: 48V 4T: 48V/12V/5V	E: 1 Unit 3" x 5" G: 1 Unit 4.75" x 7" Multiple E-Series Packages R: 2 Units (flat) S: 2 Units (stacked) T: 3 Units (flat) U: 3 Units (stacked)	A: Open-frame C: Encased	Medical Grade B: B isolation rating BF: BF isolation rating CF: CF isolation rating CFD: CF isolation rating, defibrillator proof Industrial Grade IND: Industrial

Part Numbering Example: AQ0400MU24ECBF

A dark blue banner with the text 'AC-DC Power Supplies' in white. The background of the entire top section features a red stethoscope and a white ECG line on a blue background.

ACuQOR Product Family Configurations

Mix and match a combination of 2 or 3 of any of the E-Series (3" x 5") packages in either flat or stacked packages to achieve a higher power and multiple outputs.

DOUBLE/TRIPLE STACKED

- Double Package: S, Thermal Design: C
- Small size: 3.5" x 5.25" x 3.25"
- 600W/800W @ 12V, 24V, 36V or 48V
- Triple Package: U, Thermal Design: C
- Small size: 3.5" x 5.25" x 4.875"
- 900W/1200W @ 12V, 24V, 36V or 48V



DOUBLE/TRIPLE FLAT

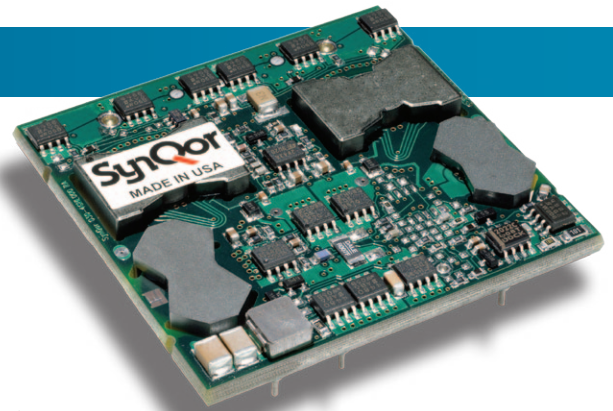
- Double Package: R, Thermal Design: C
- Small size: 6.75" x 5.25" x 1.625"
- 600W/800W/1000W @ 12V, 24V, 36V or 48V
- Triple Package: T, Thermal Design: C
- Small size: 10" x 5.25" x 1.625"
- 900W/1200W/1500W @ 12V, 24V, 36V or 48V



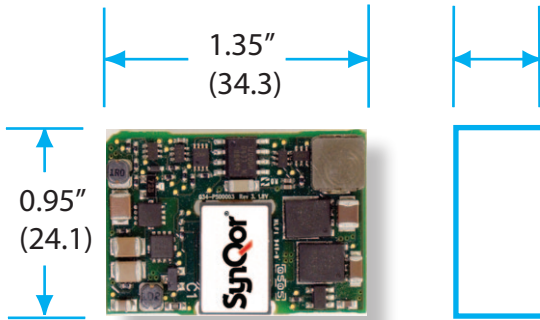
For valid part numbers, refer to the website or contact your local sales representative or distributor.

Open Frame Packages

PowerQor, DualQor and BusQor products are available in a variety of industry standard sizes/pinouts depending on power level and features. All units are available in open frame configurations as shown below. Many units are also available with varying configurations of base plates and mounting features. See website for data sheets with more details.

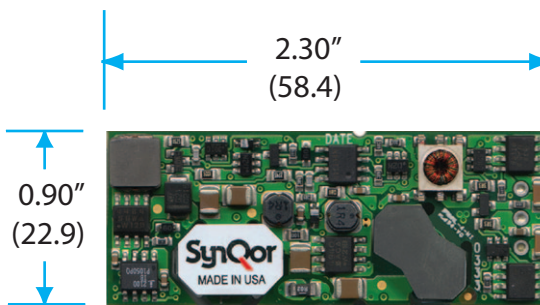


**SIXTEENTH
BRICK**



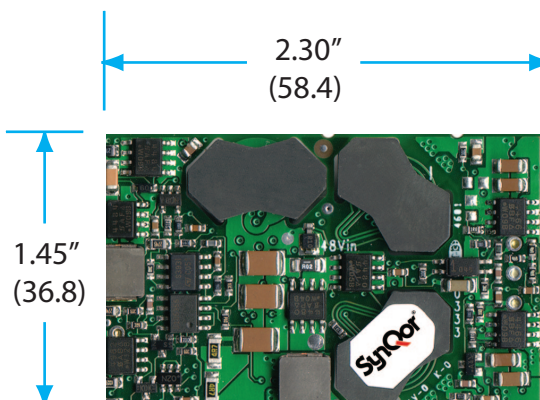
See product
datasheet for
converter height

**EIGHTH
BRICK**



See product
datasheet for
converter height

**QUARTER
BRICK**

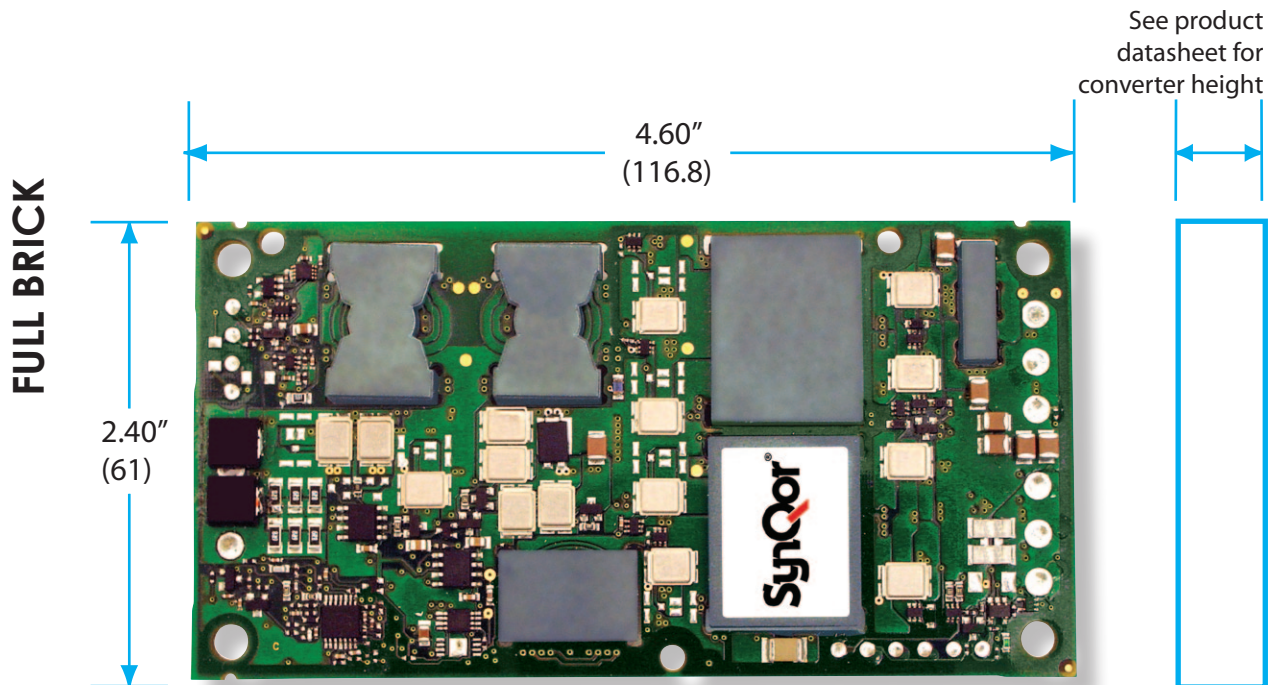
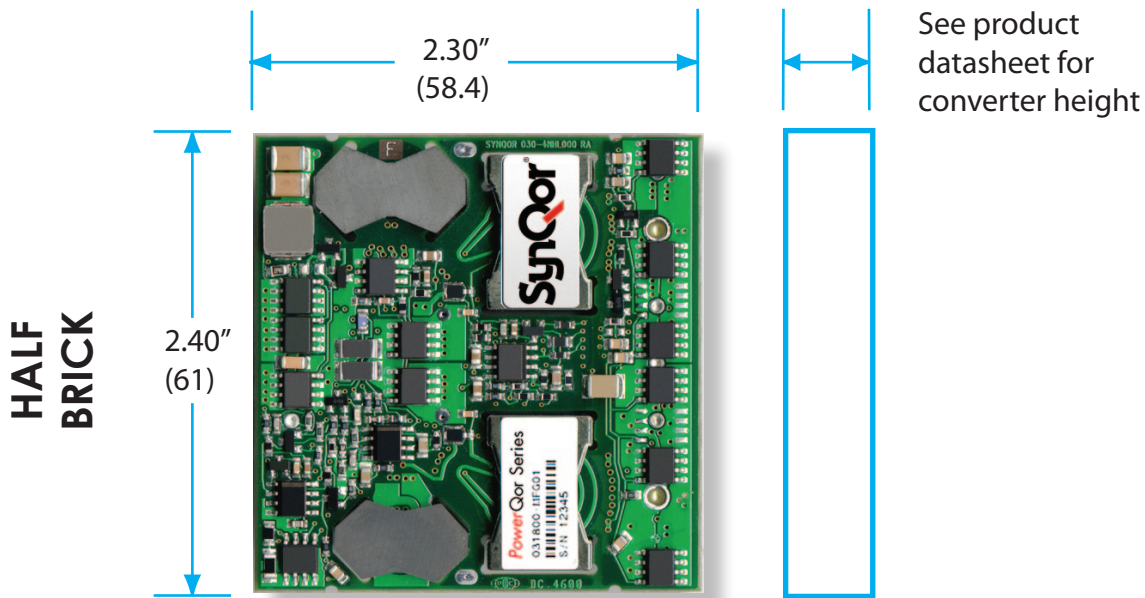


See product
datasheet for
converter height

** See website for
datasheets with
more details.*

Open Frame Packages

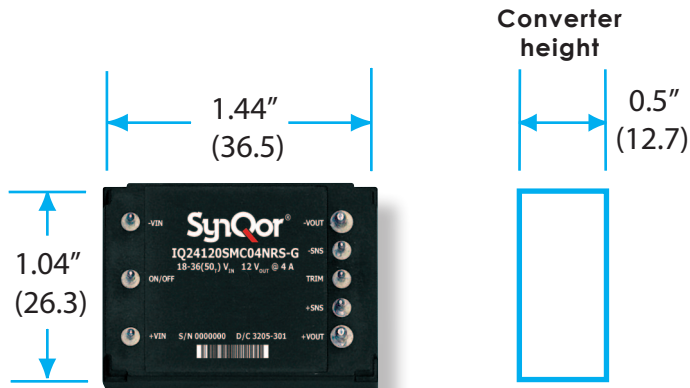
PowerQor, DualQor and BusQor products are available in a variety of industry standard sizes/pinouts depending on power level and features. All units are available in open frame configurations as shown below. Many units are also available with varying configurations of base plates and mounting features. See website for data sheets with more details.



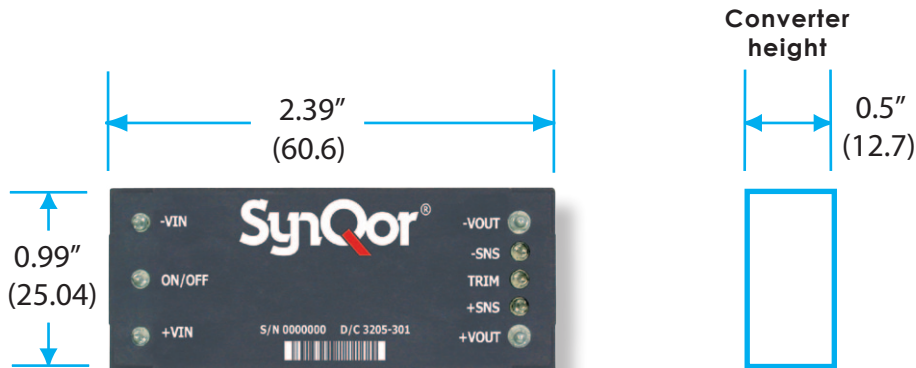
Encased Packages

InQor, Mil-COTS, high voltage NiQor and CFQor products are fully encased for additional environmental protection and available in a variety of industry standard sizes/pinouts. There are various mounting configurations consisting of threaded inserts, though-hole inserts and mounting flanges. See website for data sheets with more details.

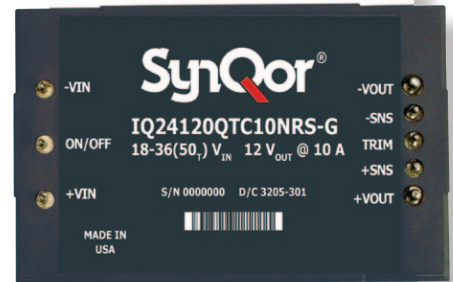
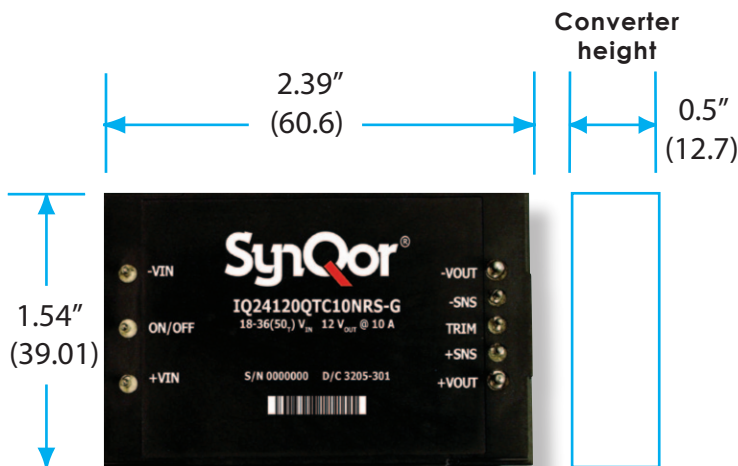
SIXTEENTH BRICK



EIGHTH BRICK

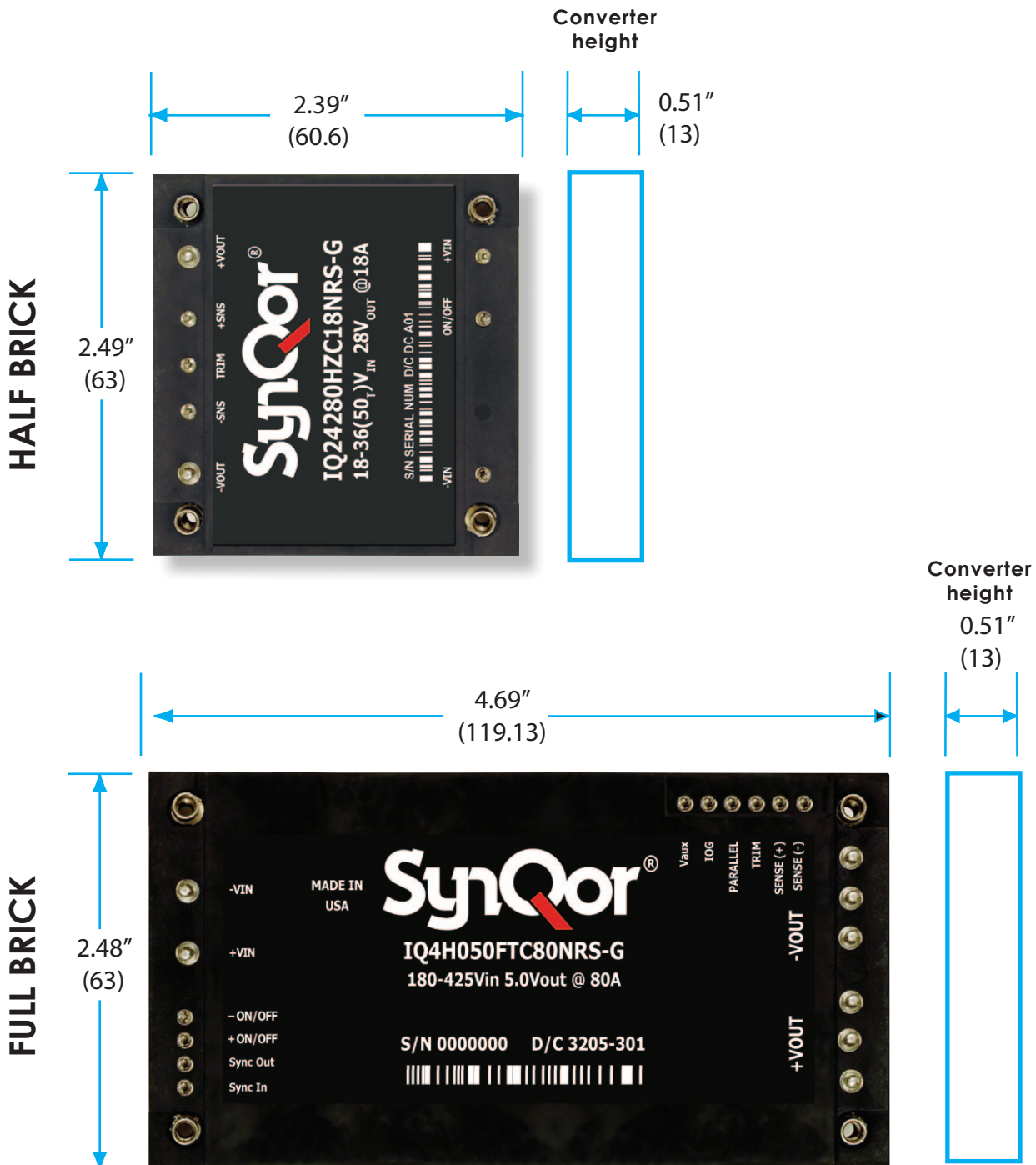


QUARTER BRICK



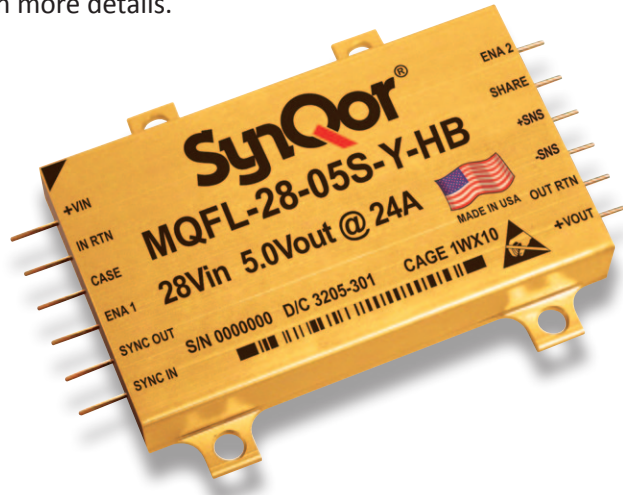
Encased Packages

InQor, Mil-COTS, high voltage NiQor and CFQor products are fully encased for additional environmental protection and available in a variety of industry standard sizes/pinouts. There are various mounting configurations consisting of threaded inserts, though-hole inserts and mounting flanges. See website for data sheets with more details.

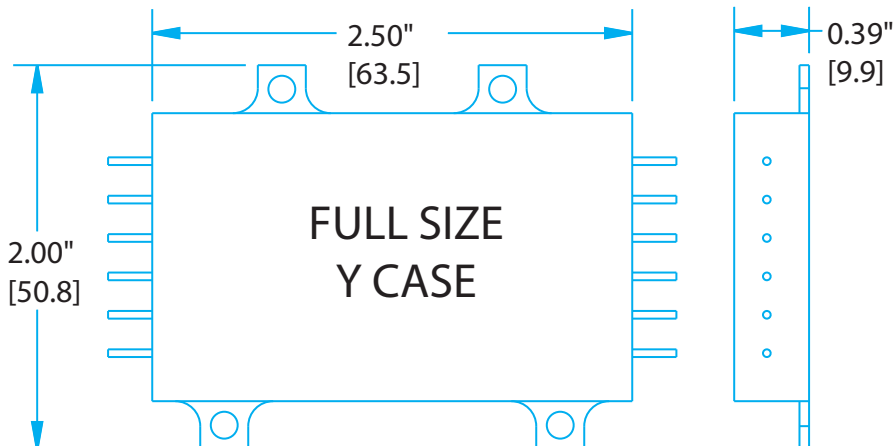
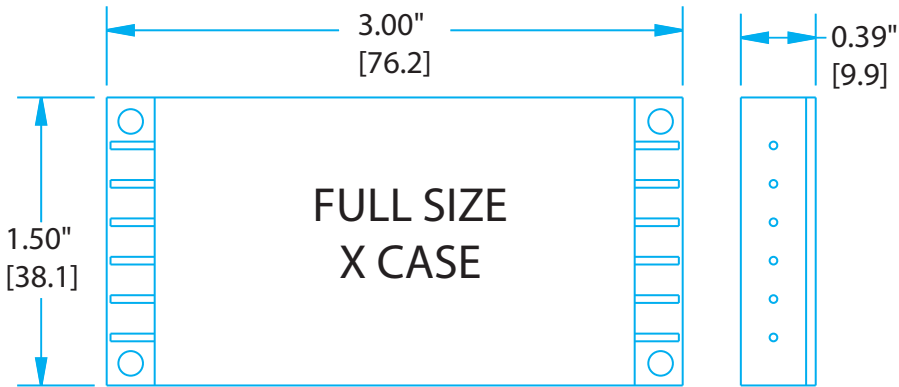


MilQor Hi-Rel Packages

Hi-Rel products are available in a variety of package mounting and lead form configurations. See website for data sheets with more details.



FL/ME PACKAGE

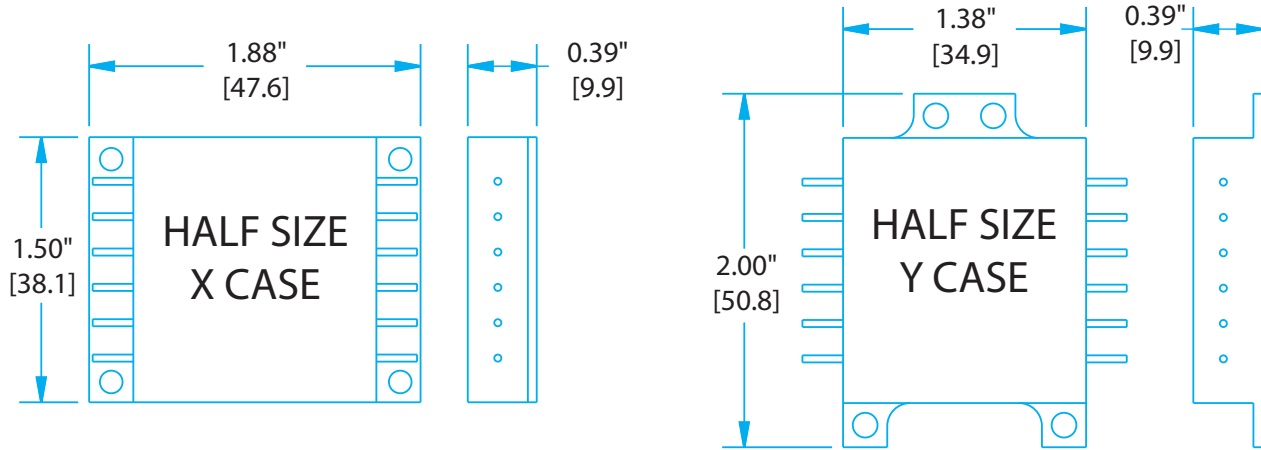


MilQor Hi-Rel Packages

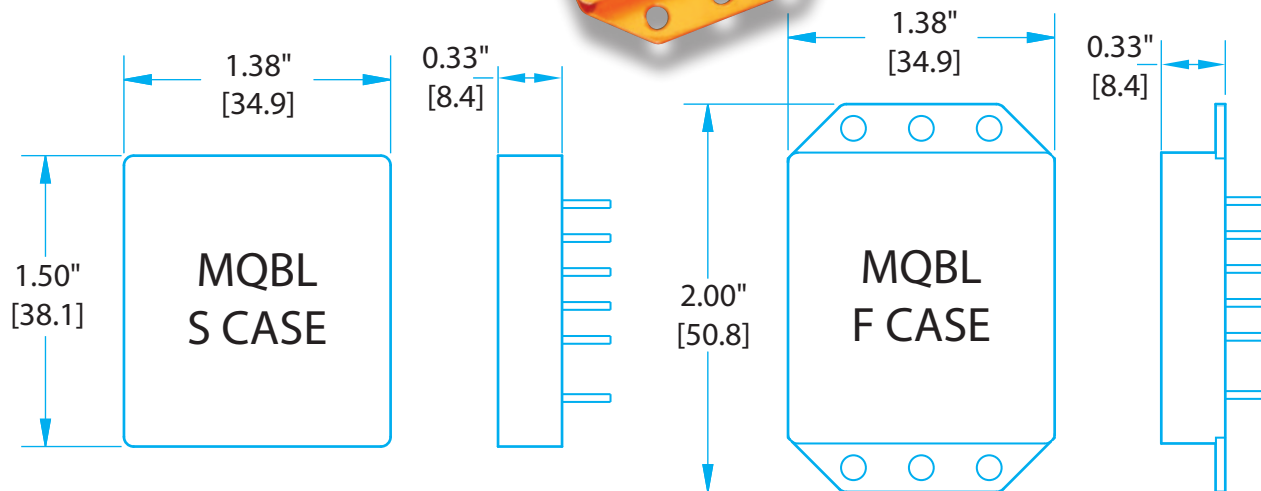
Hi-Rel products are available in a variety of package mounting and lead form configurations. See website for data sheets with more details.



HL/HR/HE PACKAGE



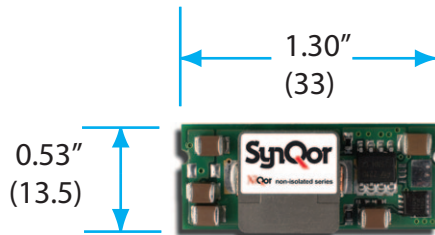
BL PACKAGE



SIP & SMT Packages

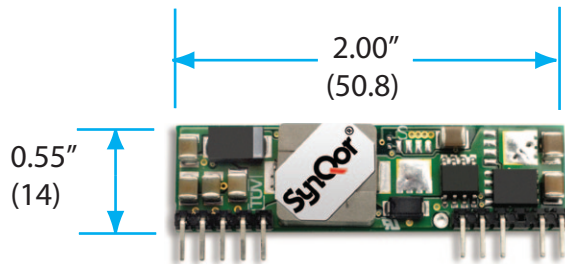
NiQor products are available in SIP and SMT packages. SIPS package options include vertical and horizontal mounting pins. See website for data sheets with more details.

NQ SURFACE MOUNT CONVERTER



See product
datasheet for
converter height

NQ SIPS CONVERTER



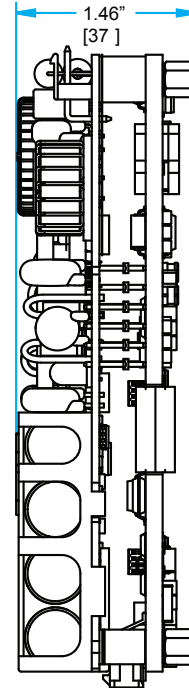
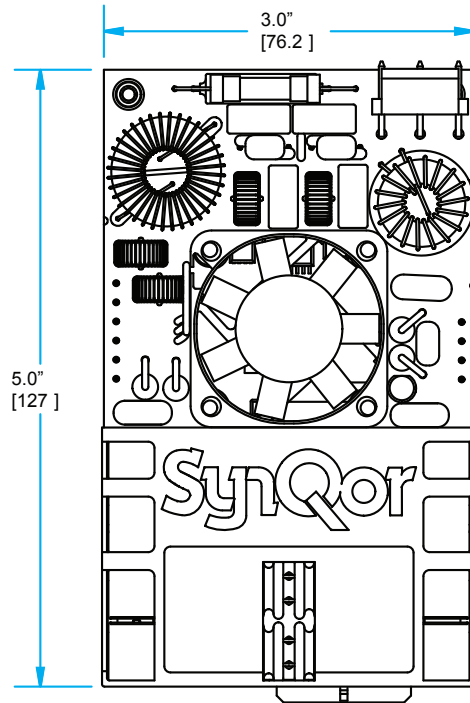
See product
datasheet for
converter width

ACuQor Product Family Packages

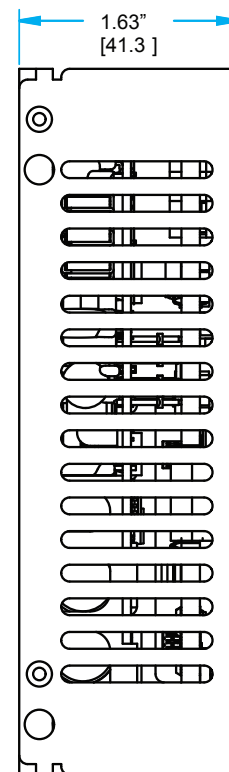
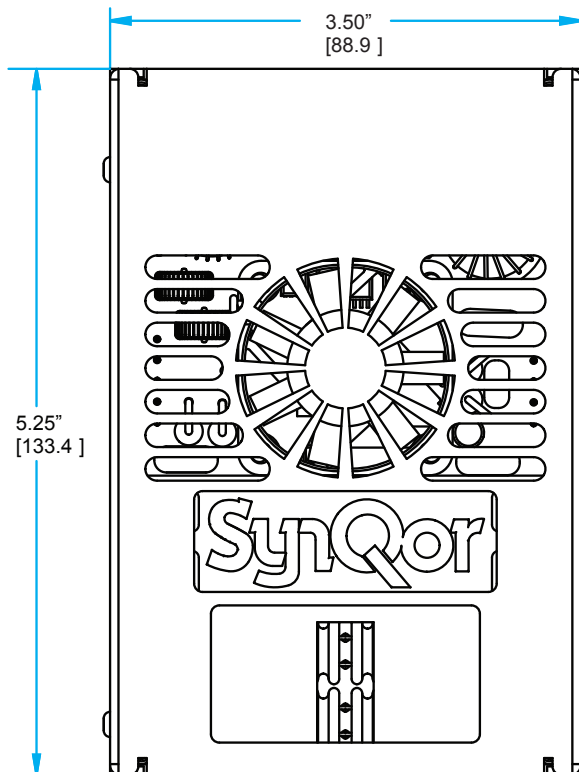
E-Series ACuQor products are available open framed or encased. They can also be double or triple stacked for additional power output. G-Series ACuQor products are available as encased product only. For both series, accessories including input and output cables are also available. See website for data sheets with more details.



**E-SERIES
OPEN FRAME
CONVERTER**



**E-SERIES
CONVERTER**

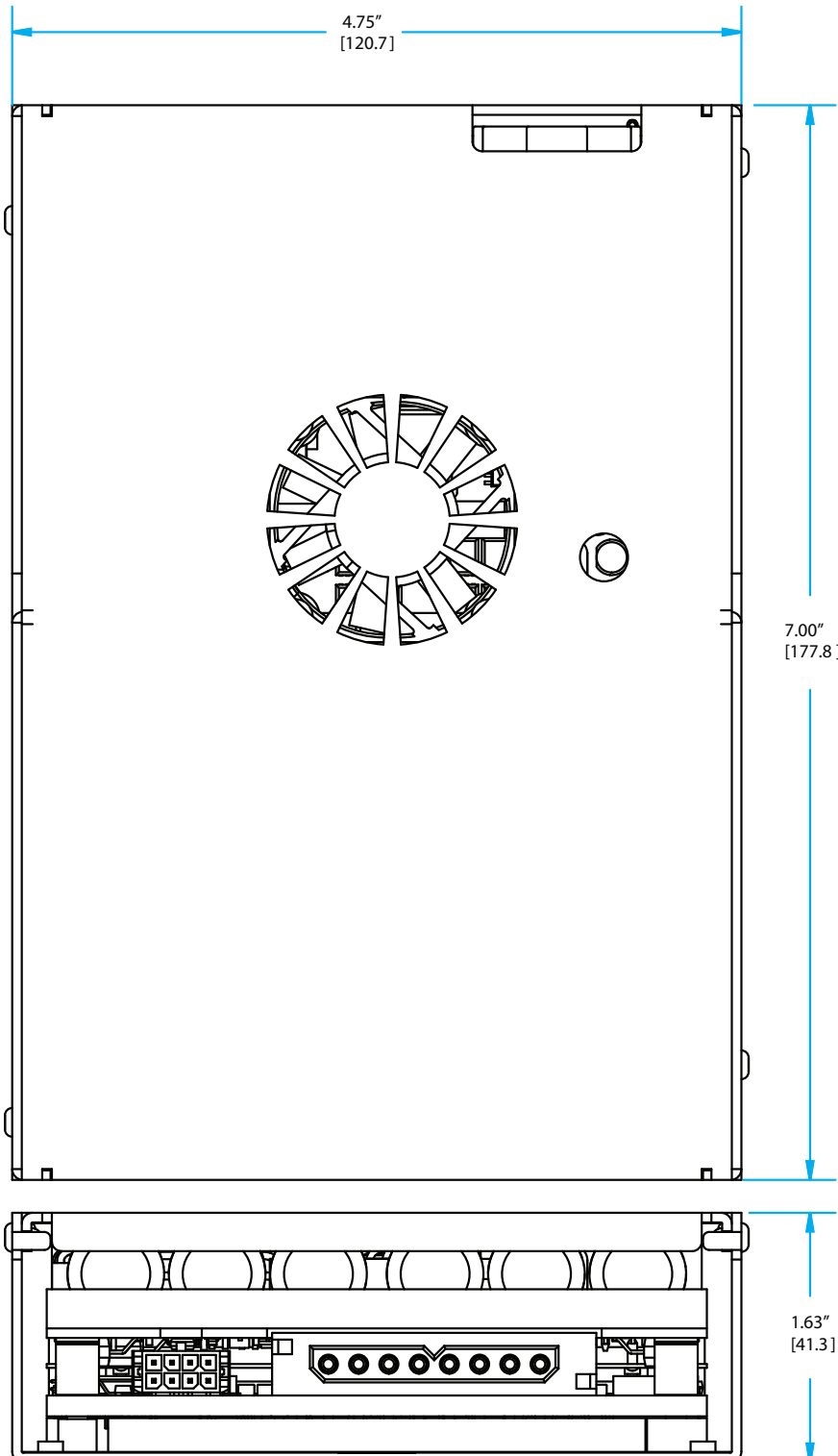


ACuQor Product Family Packages

E-Series ACuQor products are available open framed or encased. They can also be double or triple stacked for additional power output. G-Series ACuQor products are available as encased product only. For both series, accessories including input and output cables are also available. See website for data sheets with more details.



G-SERIES CONVERTER



Manufacturing

SynQor is committed to achieving the highest quality manufacturing processes while ensuring a timely supply of highly reliable product at competitive prices to our customers. To meet these objectives, SynQor designs and operates its own production lines, assuring high volume production, while retaining control over industry leading quality levels.

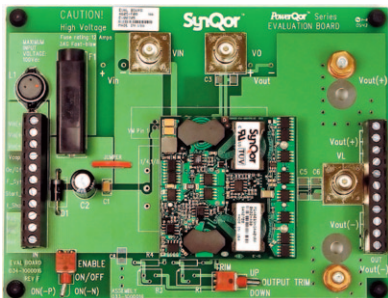
In our state-of-the-art manufacturing facility in Boxborough, MA, USA, SynQor operates a multiple cell production flow, using the latest in automated surface mount technology. The in-line, flow manufacturing process allows for virtually hands-free construction and minimal WIP processing, resulting in very high throughput and product mix that supports a flow production strategy. SynQor's use of a single PCB construction, planar magnetics and a baseplate-free design, allows for simple automated manufacturing and inspection, resulting in higher first pass yields. The high commonality of materials in SynQor designs facilitates the use of internally developed off-line set-up optimization software that allows us to plan for minimal down time and set-up between production runs. Consequently, SynQor can deliver most standard products in as little as four weeks. Also, our manufacturing expertise remains in-house, allowing us to maintain complete control over the quality and traceability of our product to the component level.

Design & Engineering

SynQor employs a stringent, 5 stage (ECO controlled, serial phase) product development process, starting with product concept design and ending with manufacturing integration. We believe that a solid design leads to efficient manufacturing, higher performance, and enhanced reliability. By designing for reliability, SynQor greatly reduces the chance of field defects and increases product integrity.

Concept Design	Design & Verification	Proof of Design	Proof of Manufacturing	Manufacturing Integration
<ul style="list-style-type: none"> • Generate electrical specification • Review performance requirements • Design simulation • Schematic • Qualify new components • Breadboard • Prelim thermal analysis 	<ul style="list-style-type: none"> • Full layout • DFMDFT Review • Build engineering prototypes • Debug circuit • Worst-case electrical testing • Component stress analysis • Stability analysis • Abnormal electrical testing • Specification review • Preliminary datasheet 	<ul style="list-style-type: none"> • Build 50-100 units and electrically characterize • Verify electrical performance • Verify component stress analysis • Statistical variations • Thermal analysis and imaging • HALT testing • Complete datasheet 	<ul style="list-style-type: none"> • 300 units in mfg. run • ATE testing • Yield analysis • Validate and finalize manufacturing processes and Tooling • 1000 hour life test • Qualification testing (humidity, vibration, DMT, PTC, thermal and mechanical shock) 	<ul style="list-style-type: none"> • Process transfer • Full documentation release (SCD's, BOM, processes, procedures, etc.) • Release qualification reports • Release final datasheet • Transfer units to finished goods

Evaluation Boards



SynQor makes it easy and affordable to evaluate the performance of our converters with our evaluation boards. All evaluation boards include socketed connectors to allow easy “plug and play” insertion and removal of multiple units while providing precise, sensed voltage measurements. Evaluation boards are designed to simplify testing of the product by providing built-in BNC connectors for easy connection to standard test equipment, screw terminals for input/output connections, and a replaceable fuse. All evaluation kits also ship with a detailed testing procedure. You can order standard (*PowerQor* and *InQor*), dual output (*DualQor*), IBA (intermediate bus architecture), *iQor* (ATCA), *ACuQor* (AC/DC) evaluation kits through your local sales representative.

Custom Power Solutions

SynQor is eager to develop partnerships with customers requiring modified standard or custom DC-DC converter designs. Our in-house power design engineers have the expertise to deliver quick and reliable solutions for your most demanding power conversion specifications. Our converter topology lends itself to fast and easy development of modified standards, including diverse output voltages, reduced current limits and special testing requirements. Please contact your local SynQor sales representative for additional information.

Product Qualification

SynQor's multi-step product qualification process tests all aspects of converter performance through DMT (design marginality testing), PTC (power thermal cycling), thermal and mechanical shock, vibration, humidity and solderability. Our extensive characterization, testing of products and manufacturing processes ensure a supply of robust and reliable product.

COMMERCIAL QUALIFICATION TESTING

Parameter	# of Units	Test Conditions
Life Test	32	1000 hours, 95% rated V_{in} and load, units at derating point
Vibration	5	10 - 55Hz sweep, 0.060" total excursions, 1 minute/sweep, 120 sweeps for 3 axis
Mechanical Shock	5	100G minimum, 3 drops in x and y axis, 1 drop in z axis
Temperature Cycling	10	500 cycles, -40°C to 100°C, unit temperature ramp of 15°C/minute
Power/Thermal Cycling	5	100 cycles, $T_{operating}$ = min to max, V_{in} = min to max, full load
Design Marginality	5	T_{min} -10°C to T_{max} +10°C, 5°C steps, V_{in} = min to max, I_{out} = 0 - 105% load
Humidity	5	1000 hours, +85°C, 85% Relative Humidity, 2 minutes on and 6 hours off
Solderability	15 pins	MIL-STD-883, method 2003 & JESD22-B102D Solderability Requirements (lead-free)

Quality & Reliability

Since its founding, SynQor has fostered a culture of quality and continual improvement across every facet of the business. Any costs associated with implementing our Quality Management System (QMS) are surpassed by the benefits of achieving world-class quality levels throughout the organization. At SynQor, we view quality as a system, not a result. Achieving quality and high reliability does not simply follow from being diligent in a few key areas. Quality requires a company-wide commitment to a closed loop process that incorporates continual improvement. At SynQor, all processes are built upon this framework and philosophy, which are detailed in our comprehensive QMS documentation. By properly defining the desired results and metrics for each process, a continual improvement system is created at every level that is consistent with SynQor's documented quality objectives.

Product Family	Demonstrated MTBF based on Field Failures	Supplied Product Quality Level (SPQL) % Failure @ Installation
PowerQor	> 985 Million Hours	95 ppm

NOTE: Data for PowerQor series bricks only. For all other products contact SynQor.

Quality requires a company-wide commitment to a closed loop process that incorporates continual improvement. At SynQor, all processes are built upon this framework and philosophy, which are detailed in our comprehensive QMS documentation. By properly defining the desired results and metrics for each process, a continual improvement system is created at every level that is consistent with SynQor's documented quality objectives.

RoHS Lead-Free & Reach Environmental Directive Compliance

The EU-led RoHS (Restriction of Hazardous Substances) Directive restricts the use of Lead, Cadmium, Hexavalent Chromium, Mercury, Polybrominated Biphenyls (PBB), Polybrominated Diphenyl Ethers (PBDE), Deca Brominated Diphenyl Ether (Deca BDE), and intentional additives Perfluorooctylsulfonates (PFOS). Additionally, the European Chemical Agency (ECHA) has listed SVHC (Substances of Very High Concern) under the EU-led REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) provisions.

SynQor products built prior to June 2006 are RoHS compliant with the exception of lead. SynQor will continue to support all existing product offerings in their current forms and will continue to support non-lead-free product going forward. All SynQor products are fully REACH compliant.

All SynQor products, with the exception of the MilQor Product Line, are currently available in fully RoHS compliant versions. SynQor has qualified the following materials that are used in SynQor's lead-free, RoHS compliant product:

- PWB Finish: ENIG
- Solder & Solder Paste: No Clean SAC 305 Lead-Free Alloy, exceeds Telcordia GR78-CORE requirements for SIR and electromigration
- Pins: Solder finish is Matte Tin over Ni under-plating (mitigates tin whisker growth)

Patents

SynQor holds the following U.S. patents, one or more of which apply to each product listed in this document. Additional patent applications may be pending or filed in the future

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	7,558,083	7,564,702	7,765,687	7,787,261

Specifications are subject to change without notice.



SynQor Headquarters

155 Swanson Road Boxborough, MA 01719-1316

Phone: 978-849-0600 Fax: 978-849-0602

Toll Free (USA): 888-567-9596

North America E-mail: power@synqor.com

Europe E-mail: saleseurope@synqor.com

Asia E-mail: salesasia@synqor.com

www.SynQor.com

Founded in 1997, SynQor® has become the technology, quality and service leader for high efficiency DC-DC converters for the telecom/datacom marketplace. The PowerQor®, BusQor®, DualQor®, iQor™, and NiQor® product lines, combined with SynQor's unmatched lead-times, flexibility, design support and lowest total cost of ownership have become the benchmark sought by SynQor's worldwide customer base.

In 2004, SynQor began its successful entry into the industrial, medical and military market segments with the InQor®, ACuQor® and MilQor® product lines. These new technology leading DC-DC and AC-DC product lines have enabled customers to realize vast savings in space, weight and overall system costs while dramatically increasing power densities and end-system performance. Equally important is the service and support advantage SynQor has brought to customers in these market segments.

SynQor is a privately owned U.S. company headquartered in Boxborough, Massachusetts, which is also the location of all of its manufacturing operations. SynQor has a design center in Dallas, Texas, and sales/marketing offices in Europe, Malaysia, Korea and China. More information is available on the company's website at www.synqor.com.

ADVANCING THE POWER CURVE®