

35-55V
Input

9.6V
Output

43A
Current

2000Vdc
Isolation

Quarter-brick
DC Bus Converter

The BusQor® BQ55090QPA40 bus converter is a next-generation, board-mountable, isolated, fixed switching frequency DC/DC converter 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. The BusQor series provides an isolated step down voltage from 48V to a 9.6V intermediate bus with no regulation in a standard "quarter-brick" module. BusQor converters are ideal for creating the mid-bus voltage required to drive point-of-load (non-isolated) converters in intermediate bus architectures. RoHS compliant (see page 12).

BusQor®
Bus
Converter



BQ55090QPA40 Module

Operational Features

- Ultra-high efficiency, 96.5% at 40A
- Delivers up to 43 amps of output current with minimal derating - no heatsink required
- Input voltage range: 35V – 55V provides 6.5-11V bus for distributed power architectures
- Fixed frequency switching provides predictable EMI performance

Mechanical Features

- Industry standard quarter-brick bus converter pin-out
- Industry standard size: 1.45" x 2.3" (36.8x58.4mm)
- Total height only 0.467" (11.86mm), permits better air-flow and smaller card pitch
- Total weight: 1.5 oz. (42 grams)
- Flanged pins designed to permit surface mount soldering (avoid wave solder) using FPiP technique

Control Features

- On/Off control referenced to input side (positive and negative logic options available)
- Inherent current share (by droop method) for high current and parallel applications.

Protection Features

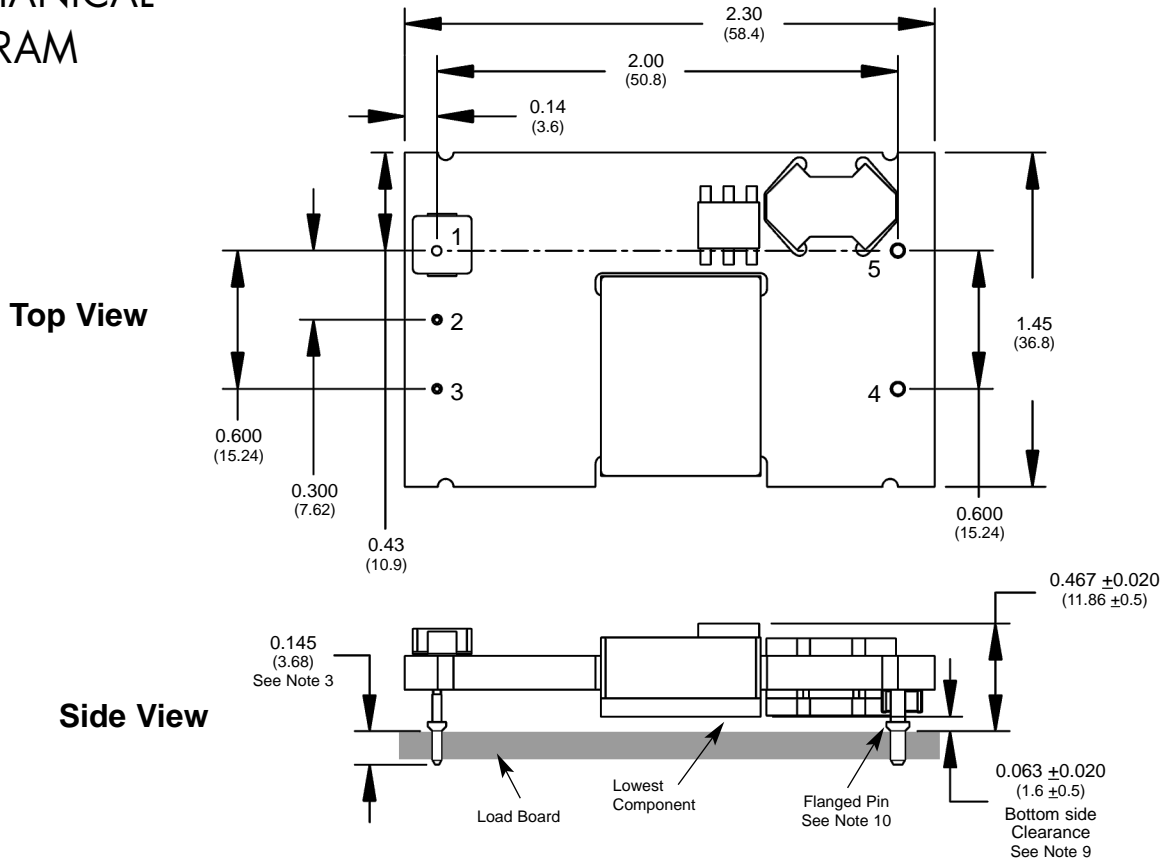
- Input under-voltage lockout and over-voltage shutdown protects against abnormal input voltages
- Output current limit and short circuit protection
- Thermal shutdown

Safety Features

- 2000V, 30 MΩ input-to-output isolation
- UL/cUL 60950-1 recognized (US & Canada), basic insulation rating
- TUV certified to EN60950-1
- Meets 72/23/EEC and 93/68/EEC directives
- Meets UL94V-0 flammability requirements

Input: 35-55 V
Output: 9.6 V
Current: 43 A
Package: Quarter-brick

MECHANICAL DIAGRAM



NOTES

- 1) Pins 1-3 are 0.040" (1.02mm) diameter with 0.080" (2.03 mm) diameter standoff shoulders.
- 2) Pins 4 and 5 are 0.062" (1.57 mm) diameter with 0.100" (2.54 mm) diameter standoff shoulders.
- 3) Other pin extension lengths available. Recommended pin length is 0.03" (0.76mm) greater than the PCB thickness.
- 4) All Pins: Material - Copper Alloy
Finish - Matte Tin over Nickel plate
- 5) Undimensioned components are shown for visual reference only.
- 6) All dimensions in inches (mm)
Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm)
x.xxx +/-0.010 in. (x.xx +/-0.25mm)
- 7) Weight: 1.5 oz. (42 g) typical
- 8) Workmanship: Meets or exceeds IPC-A-610C Class II
- 9) UL/TUV standards require a clearance of 0.04" (1.02mm) around primary areas of the module. Refer to section on Keep Out Areas under Application Considerations for details.
- 10) The flanged pins are designed to permit surface mount soldering (allowing to avoid the wave soldering process) through the use of the flanged pin-in-paste technique.

PIN DESIGNATIONS

Pin No.	Name	Function
1	Vin(+)	Input Positive (35V - 55V)
2	ON/OFF	Logic control input to turn converter on and off.
3	Vin(-)	Input Negative
4	Vout(-)	Output Negative
5	Vout(+)	Output Positive



Technical Specification

Input: 35-55 V
Output: 9.6 V
Current: 43 A
Package: Quarter-brick

BQ55090QPA40 ELECTRICAL CHARACTERISTICS

T_A=25°C, airflow rate=300 LFM, V_{in}=48Vdc unless otherwise noted; full operating temperature range is -40°C to +100°C ambient temperature with appropriate power derating. Specifications subject to change without notice.

Parameter	Min.	Typ.	Max.	Units	Notes & Conditions
ABSOLUTE MAXIMUM RATINGS					
Input Voltage					
Non-Operating			60	V	Continuous
Operating			55	V	Continuous
Isolation Voltage (input to output)			2000	V	Basic insulation, Pollution Degree 2
Operating Temperature	-40		100	°C	
Storage Temperature	-55		125	°C	
Voltage at ON/OFF input pin	-2		18	V	
INPUT CHARACTERISTICS					
Operating Input Voltage Range	35	48	55	V	
Input Under-Voltage Lockout					
Turn-On Voltage Threshold	30		34	V	
Turn-Off Voltage Threshold	29		31	V	
Lockout Voltage Hysteresis	2		4	V	
Input Over-Voltage Shutdown					
Turn-Off Voltage Threshold	58.5	59.5		V	
Turn-On Voltage Threshold	57	58		V	
Maximum Input Current			9.5	A	100% Load, 35 V _{in}
No-Load Input Current			0.13	A	
Disabled Input Current		7.0		mA	
Inrush Current Transient Rating			0.01	A ² s	
Input Reflected Ripple Current		7	10	mA	RMS through 10µH inductor; Figure 14
Input Terminal Ripple Current		140		mA	RMS; Figure 13
Recommended Input Fuse			20	A	Fast blow external fuse recommended
Input Filter Component Values (L\C)		0.22\11		µH\µF	Internal values
Recommended External Input Capacitance		47		µF	Typical ESR 0.1-0.2Ω,
OUTPUT CHARACTERISTICS					
Output Voltage Set Point		9.6		V	48V _{in} , no load
Output Voltage Regulation					
Over Line		42\4.0		%\V	
Over Load		5.2\500		%\mV	
Over Temperature		2\200		%\mV	
Total Output Voltage Range	6.5		11.0	V	Over sample, line, load, temperature & life
Output Voltage Ripple and Noise					20MHz bandwidth
Peak-to-Peak		50	100	mV	Full Load; see Figure 15
RMS		12		mV	Full Load
Operating Output Current Range	0		43	A	Subject to derating
Output DC Current-Limit Inception		50		A	
Output DC Current-Limit Shutdown Voltage		5		V	
Current Share Accuracy (3 units paralleled)		±10		%	Above 50% of rated output current
Back-Drive Current Limit while Disabled		10		mA	Negative current drawn from output
Maximum Output Capacitance			4,000	µF	9.6V _{out} at 40A Resistive Load
DYNAMIC CHARACTERISTICS					
Input Voltage Ripple Rejection		14		dB	Figure 19
Output Voltage during Load Current Transient					
For a Step Change in Output Current (0.1A/µs)		200		mV	50%-75%-50% I _{out} max; Figure 11
Settling Time		100		µs	To within 1% V _{out} nom
Turn-On Transient					
Turn-On Time (without output capacitance)			250	µs	Full load, V _{out} =90% nom., 0 output cap.
Turn-On Time (with output capacitance)		3	5	ms	Full load, V _{out} =90% nom., 3,000 µF cap.
Output Voltage Overshoot		0		%	3,000 µF load cap., I _{out} = 0A, V _{in} nom.
EFFICIENCY					
93% Load		96.5		%	Figure 1; 48V _{in} , 40A
50% Load		97.0		%	Figure 1
TEMPERATURE LIMITS FOR POWER DERATING CURVES					
Semiconductor Junction Temperature (see Note 1)			125	°C	Package rated to 175°C
Board Temperature			125	°C	Board rated to 165°C
Transformer Temperature			125	°C	
ISOLATION CHARACTERISTICS					
Isolation Voltage (dielectric strength)		2000		V	
Isolation Resistance		30		MΩ	

1. For normal operating conditions of 55°C ambient temperature and 200 LFM airflow. Device is designed to operate for a minimum of 72 hours, once per year under the following conditions: 70°C, 200 LFM airflow, 38V_{in}, 300W output power. Junction temperature during those conditions will exceed the listed specification.



Technical Specification

Input: 35-55 V
Output: 9.6 V
Current: 43 A
Package: Quarter-brick

ELECTRICAL CHARACTERISTICS (Continued)

Parameter	Min.	Typ.	Max.	Units	Notes & Conditions
FEATURE CHARACTERISTICS					
Switching Frequency	170	200	230	kHz	
ON/OFF Control (Option P)					
Off-State Voltage	-1.0		0.8	V	
On-State Voltage	2.4		18	V	
ON/OFF Control (Option N)					
Off-State Voltage	2.4		18	V	
On-State Voltage	-1.0		0.8	V	
ON/OFF Control (Either Option)					Figures A & B
Pull-Up Voltage		10		V	
Pull-Up Resistance		28		kΩ	
Over-Temperature Shutdown	145		150	°C	Average PCB Temperature
Over-Temperature Shutdown Restart Hysteresis		10		°C	
Load Current Scale Factor		3333			See App Note: Output Load Current Calc.
RELIABILITY CHARACTERISTICS					
Calculated MTBF (Telcordia)		4.8		10 ⁶ Hrs.	TR-NWT-000332; 80% load, 300LFM, 40°C T _a
Calculated MTBF (MIL-217)		3.3		10 ⁶ Hrs.	MIL-HDBK-217F; 80% load, 300LFM, 40°C T _a
Field Demonstrated MTBF				10 ⁶ Hrs.	See our website for details

STANDARDS COMPLIANCE

Parameter	Notes
STANDARDS COMPLIANCE	
UL/cUL 60950-1	File # E194341, Basic insulation & pollution degree 2
EN60950-1	Certified by TUV
72/23/EEC	
93/68/EEC	
Needle Flame Test (IEC 695-2-2)	Test on entire assembly; board & plastic components UL94V-0 compliant
IEC 61000-4-2	ESD test, 8kV - NP, 15kV air - NP (Normal Performance)
GR-1089-CORE	Section 7 - electrical safety, Section 9 - bonding/grounding

- An external input fuse must always be used to meet these safety requirements. Contact SynQor for official safety certificates on new releases or download from the [SynQor website](#).

QUALIFICATION TESTING

Parameter	# Units	Test Conditions
QUALIFICATION TESTING		
Life Test	32	95% rated V _{in} and load, units at derating point, 1000 hours
Vibration	5	10-55Hz sweep, 0.060" total excursion, 1 min./sweep, 120 sweeps for 3 axis
Mechanical Shock	5	100g minimum, 2 drops in x and y axis, 1 drop in z axis
Temperature Cycling	10	-40°C to 100°C, unit temp. ramp 15°C/min., 500 cycles
Power/Thermal Cycling	5	Toperating = min to max, V _{in} = min to max, full load, 100 cycles
Design Marginality	5	T _{min} -10°C to T _{max} +10°C, 5°C steps, V _{in} = min to max, 0-105% load
Humidity	5	85°C, 85% RH, 1000 hours, 2 minutes on and 6 hours off
Solderability	15 pins	MIL-STD-883, method 2003

- Extensive characterization testing of all SynQor products and manufacturing processes is performed to ensure that we supply robust, reliable product. Contact the factory for official product family qualification documents.

OPTIONS

SynQor provides various options for Logic Sense, Pin Length and Feature Set for this family of DC/DC converters. Please consult the [last page](#) of this specification sheet for information on available options.

PATENTS

SynQor is protected under various patents. Please consult the [last page](#) for further information.

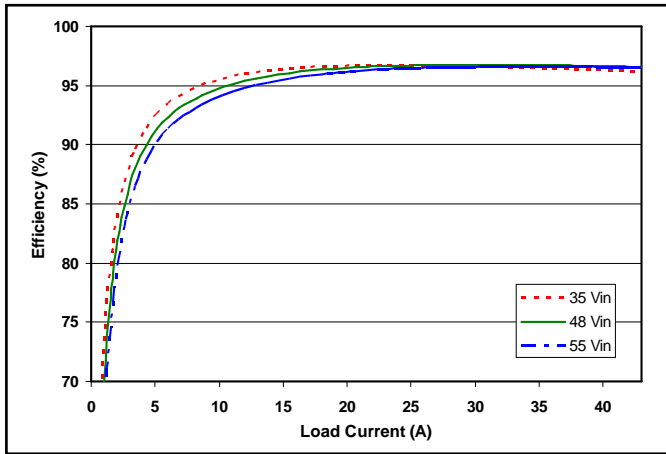


Figure 1: Efficiency at nominal output voltage vs. load current for minimum, nominal, and maximum input voltage at 25°C.

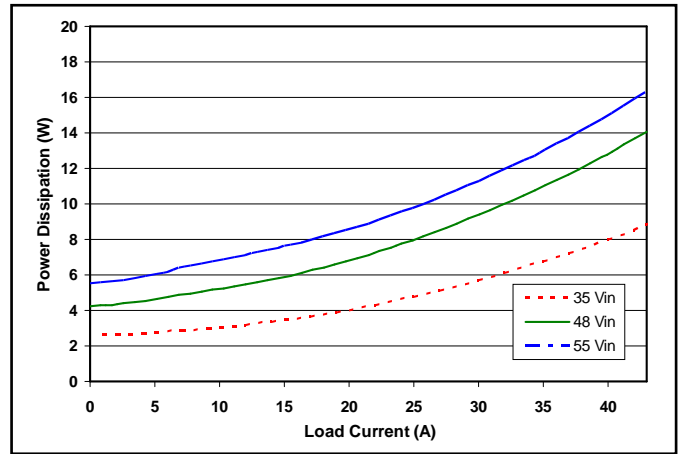


Figure 2: Power dissipation at nominal output voltage vs. load current for minimum, nominal, and maximum input voltage at 25°C.

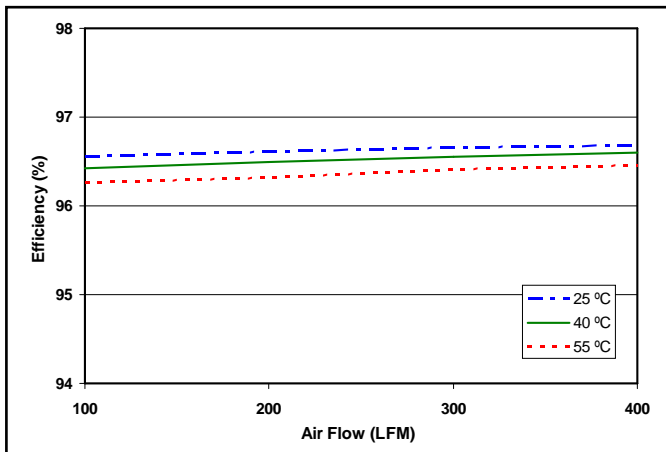


Figure 3: Efficiency at nominal output voltage and 60% rated power vs. airflow rate for ambient air temperatures of 25°C, 40°C, and 55°C (nominal input voltage).

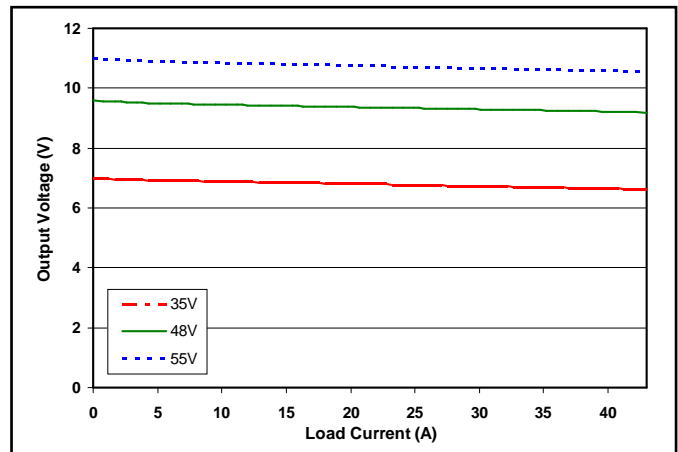


Figure 4: Output voltage regulation vs. load current for minimum, nominal, and maximum input voltage at 25°C.

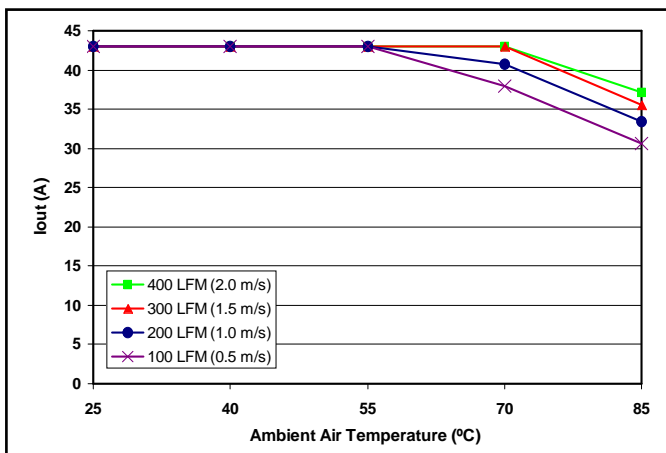


Figure 5: Maximum output power derating curves vs. ambient air temperature for airflow rates of 100 LFM through 400 LFM with air flowing from pin 3 to pin 1 (nominal input voltage).

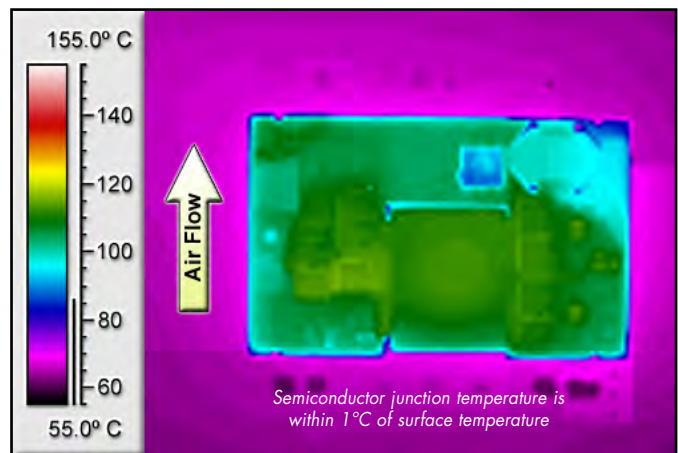


Figure 6: Thermal plot of converter at 43 amp load current (400W) with 55°C air flowing at the rate of 200 LFM. Air is flowing across the converter from pin 3 to pin 1 (nominal input voltage).

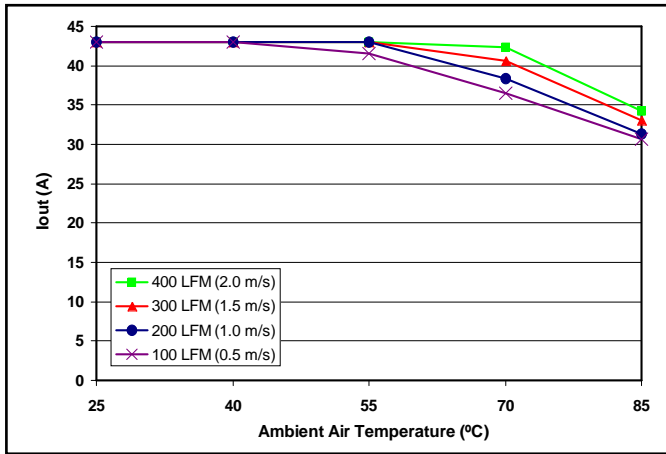


Figure 7: Maximum output power derating curves vs. ambient air temperature for airflow rates of 100 LFM through 400 LFM with air flowing from output to input (nominal input voltage).

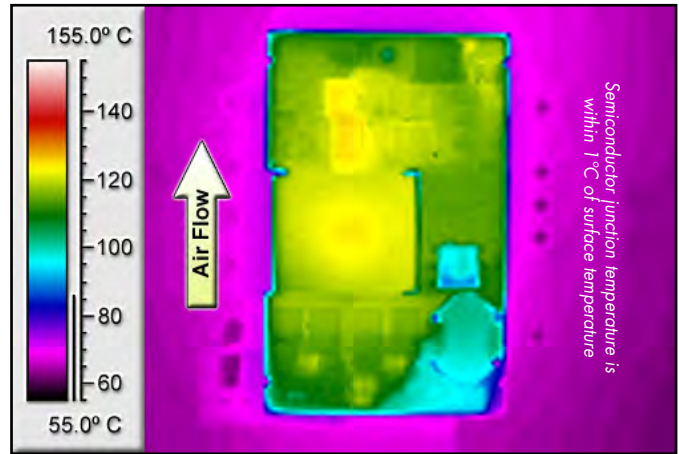


Figure 8: Thermal plot of converter at 43 amp load current (400W) with 55°C air flowing at the rate of 200 LFM. Air is flowing across the converter from output to input (nominal input voltage).

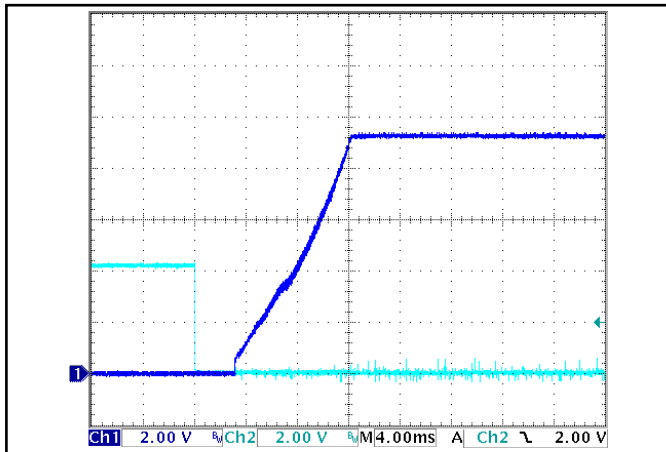


Figure 9: Turn-on transient at half load (resistive load) and 3mF output capacitance (2.0ms/div). Input voltage pre-applied. Channel 1: Vout (2V/div). Channel 2: ON/OFF input (2V/div).

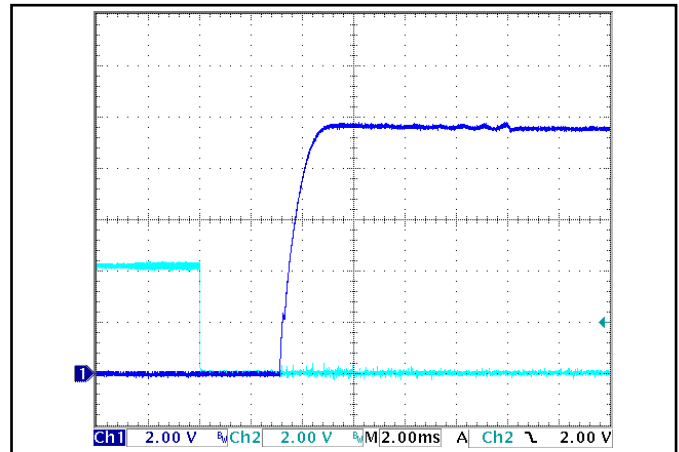


Figure 10: Turn-on transient at zero load and 3mF output capacitance (2.0ms/div). Input voltage pre-applied. Channel 1: Vout (2V/div). Channel 2: ON/OFF input (2V/div).

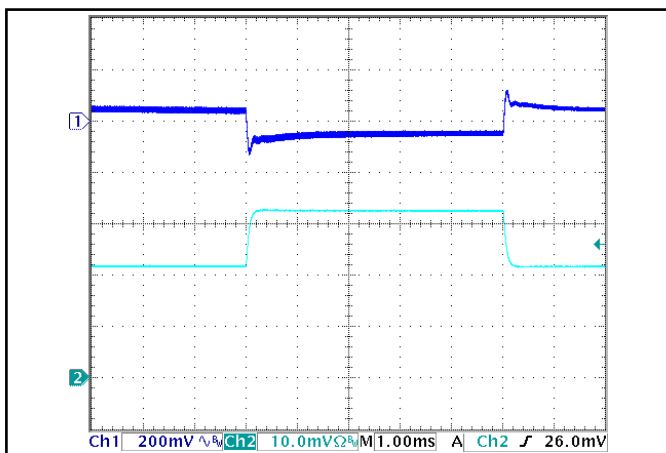


Figure 11: Output voltage response to step-change in load current (50%-75%-50% of Iout(max); dI/dt = 0.1A/μs). Load cap: 15μF, 100 mΩ ESR tantalum cap and 1μF ceramic cap. Top trace: Vout (200mV/div), Bottom trace: Iout (10A/div).

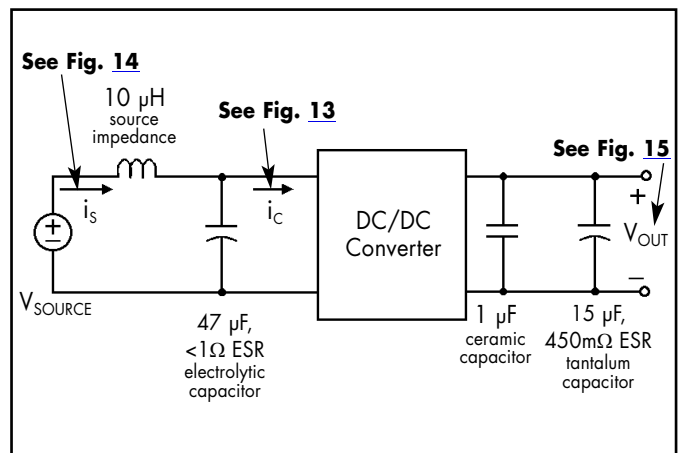


Figure 12: Test set-up diagram showing measurement points for Input Terminal Ripple Current (Figure 13), Input Reflected Ripple Current (Figure 14) and Output Voltage Ripple (Figure 15).

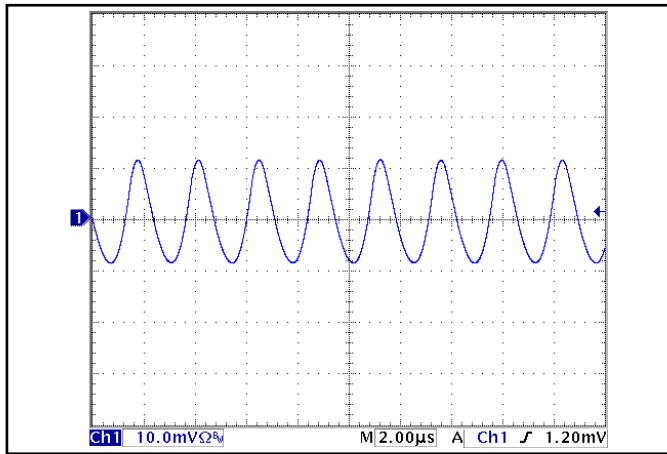


Figure 13: Input Terminal Ripple Current, i_c , at full rated output current and nominal input voltage with $10\mu\text{H}$ source impedance and $47\mu\text{F}$ electrolytic capacitor (50 mA/div). See Figure 12.

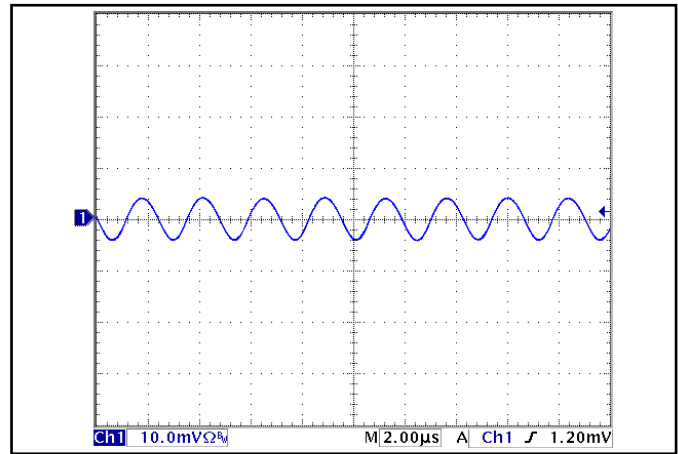


Figure 14: Input reflected ripple current, i_s , through a $10\mu\text{H}$ source inductor at nominal input voltage and rated load current (5mA/div). See Figure 12.

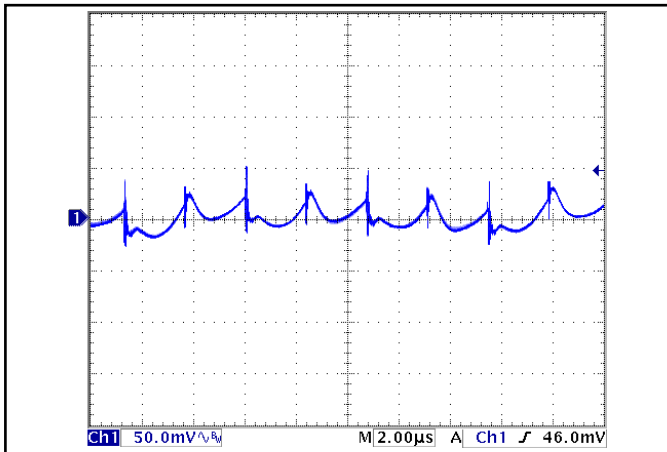


Figure 15: Output voltage ripple at nominal input voltage and rated load current (50 mV/div). Load capacitance: $1\mu\text{F}$ ceramic capacitor and $15\mu\text{F}$ tantalum capacitor. Bandwidth: 20 MHz. See Figure 12.

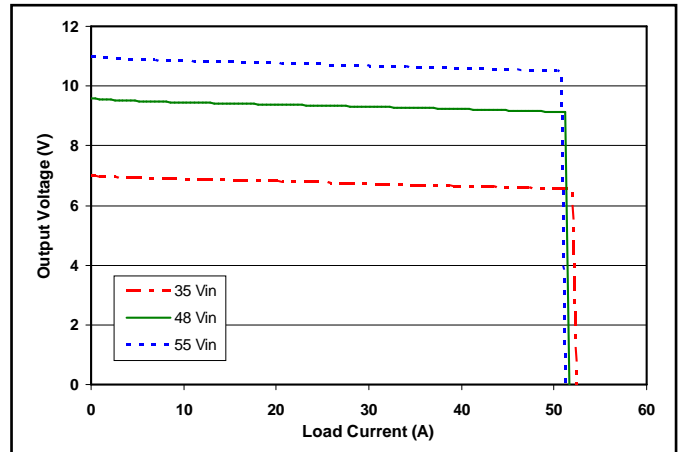


Figure 16: Output voltage vs. load current showing typical current limit curves and converter shutdown points.

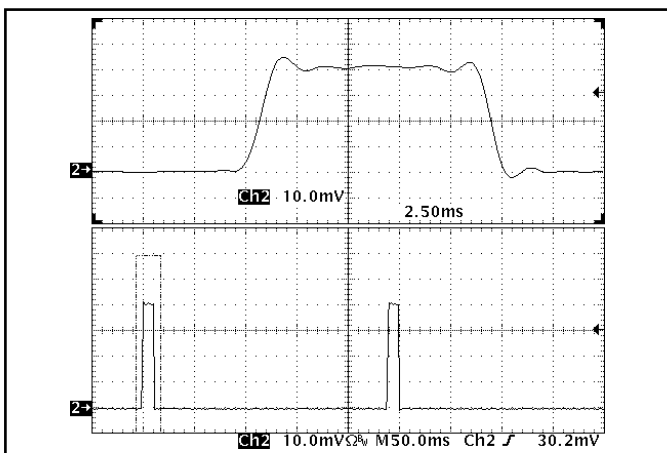


Figure 17: Load current (10A/div) as a function of time when the converter attempts to turn on into a $1\text{ m}\Omega$ short circuit. Top trace (5.0ms/div) is an expansion of the on-time portion of the bottom trace.

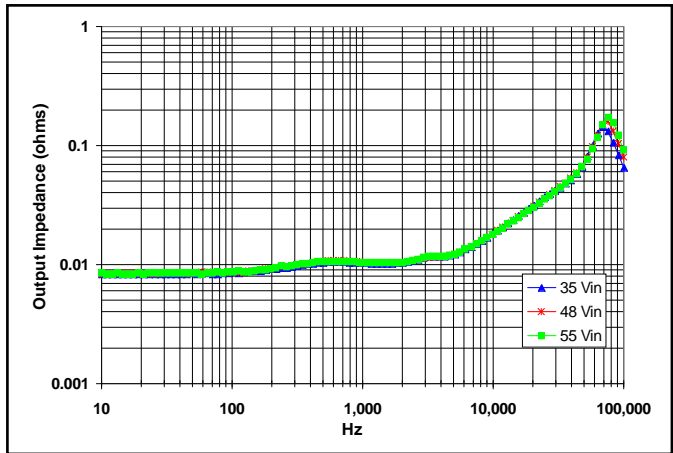


Figure 18: Magnitude of incremental output impedance ($Z_{out} = v_{out}/i_{out}$) for minimum, nominal, and maximum input voltage at full rated power.

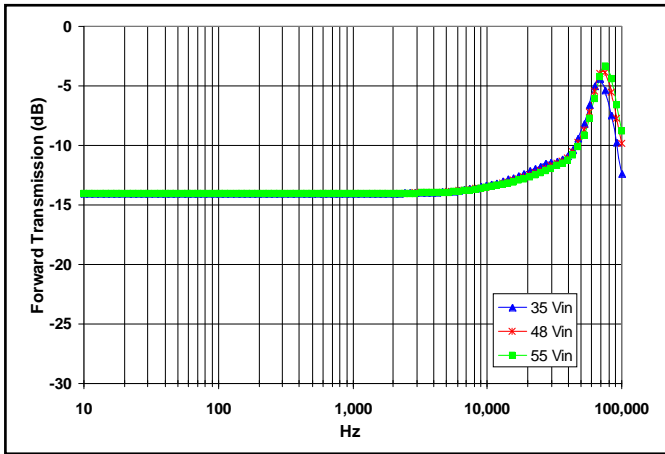


Figure 19: Magnitude of incremental forward transmission ($FT = v_{out}/v_{in}$) for minimum, nominal, and maximum input voltage at full rated power.

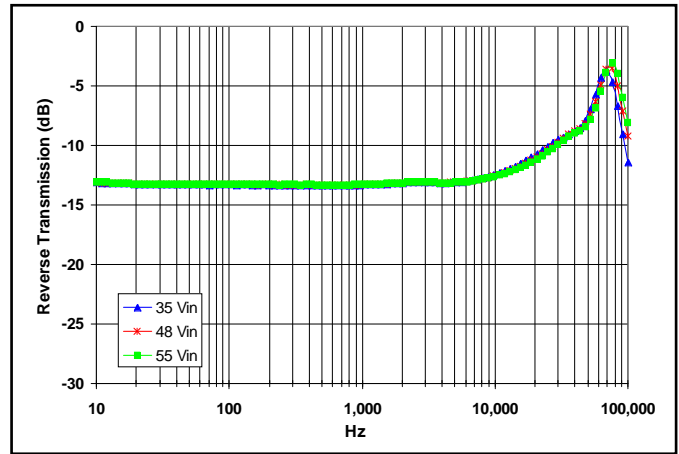


Figure 20: Magnitude of incremental reverse transmission ($RT = i_{in}/i_{out}$) for minimum, nominal, and maximum input voltage at full rated power.

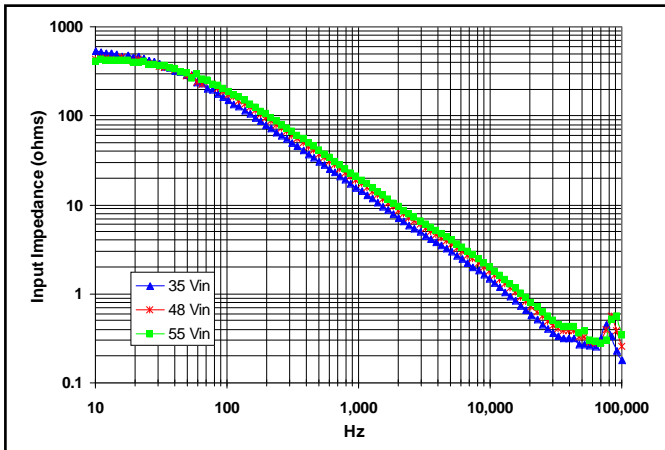


Figure 21: Magnitude of incremental input impedance ($Z_{in} = v_{in}/i_{in}$) for minimum, nominal, and maximum input voltage at full rated power.

BASIC OPERATION AND FEATURES

With voltages dropping and currents rising, the economics of an Intermediate Bus Architecture (IBA) are becoming more attractive, especially in systems requiring multiple low voltages. IBA systems separate the role of isolation and voltage scaling from regulation and sensing. The *BusQor* series bus converter provides isolation and an unregulated voltage step down in one compact module, leaving regulation to simpler, less expensive non-isolated converters.

In Figure A below, the *BusQor* module provides the isolation stage of the IBA system. The isolated bus then distributes power to the non-isolated buck regulators to generate the required voltage levels at the points of load. In this case, the bucks are represented with SynQor's *NiQor* series of non-isolated DC/DC converters. In many applications requiring multiple low voltage outputs, significant savings can be achieved in board space and overall system costs.

When designing an IBA system with bus converters, the designer can select from a variety of bus voltages. While there is no universally ideal bus voltage, most designs employ one of the following: 12V, 9V, 7.5V, 5V, or 3.3V. Higher bus voltages can lead to lower efficiency for the buck regulators but are more efficient for the bus converter and provide lower board level distribution current. Lower bus voltages offer the opposite trade offs.

SynQor's 9.6Vout *BusQor* module acts as a true dc transformer. The output voltage is proportional to the input voltage, with a specified "turns ratio" or voltage ratio, plus minor drop from the internal resistive losses in the module. When used in IBA systems,

the output variation of the *BusQor* must be in accordance with the input voltage range of the non-isolated converters being employed.

The *BusQor* architecture is very scalable, meaning multiple bus converters can be connected directly in parallel to allow current sharing for higher power applications.

CONTROL FEATURES

REMOTE ON/OFF (Pin 2): The ON/OFF input, Pin 2, permits the user to control when the converter is *on* or *off*. This input is referenced to the return terminal of the input bus, $V_{in(-)}$. There are two versions of the converter that differ by the sense of the logic used for the ON/OFF input.

In the positive logic version, the ON/OFF input is active high (meaning that a high turns the converter *on*). In the negative logic version, the ON/OFF signal is active low (meaning that a low turns the converter *on*). Figure B is a detailed look of the internal ON/OFF circuitry.

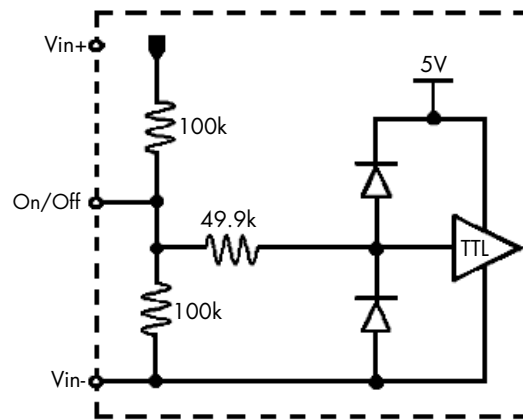


Figure B: Internal ON/OFF pin circuitry

PROTECTION FEATURES

Input Under-Voltage Lockout: The converter is designed to turn off when the input voltage is too low, helping avoid an input system instability problem, described in more detail in the application note titled "Input System Instability". The lockout circuitry is a comparator with DC hysteresis. When the input voltage is rising, it must exceed the typical Turn-On Voltage Threshold value (listed on the [specification page](#)) before the converter will turn on. Once the converter is on, the input voltage must fall below the typical Turn-Off Voltage Threshold value before the converter will turn off. Also see Figure E.

Output Current Limit: The output of the *BusQor* module is

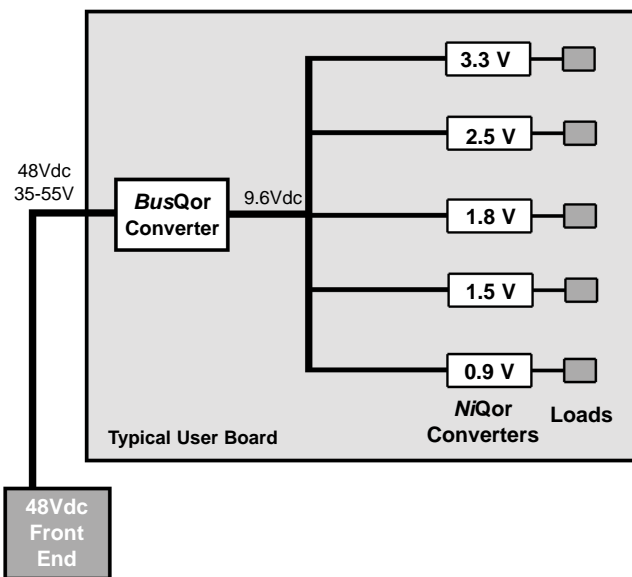


Figure A: Example of Intermediate Bus Architecture using *BusQor* bus converter and *NiQor* non-isolated converters

electronically protected against output overloads. When an overload current greater than the “DC Current-Limit Inception” specification is drawn from the output, the output shuts down to zero volt in a period of 20ms typical (see Figure C). The shutdown period lasts for a typical period of 250ms (Figure D) after which the *BusQor* tries to power up again. If the overload persists, the output voltage will go through repeated cycles of shutdown and restart with a duty cycle of 9% (On) and 91% (Off) respectively. The *BusQor* module returns (auto resetting) to normal operation once the overload is removed. The *BusQor* is designed to survive

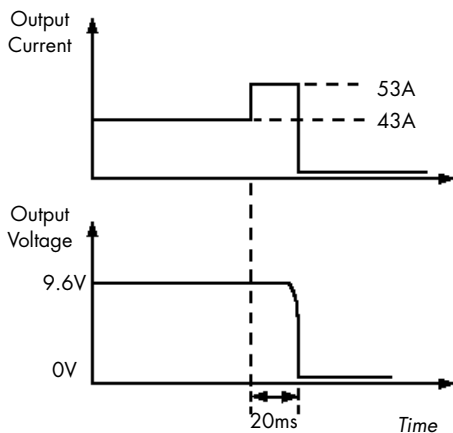


Figure C: Output Overload protection diagram (not to scale)

in this mode indefinitely without damage and without human intervention.

Output Short Circuit Protection: When the output of the *BusQor* module is shorted, a peak current of typically 72A will flow into the short circuit for a period of about 230ms. The output of the *BusQor* will shutdown to zero volts for the same period (Figure D). The shutdown period lasts for a period of 20ms, at the end of which the *BusQor* module tries to power up again. If the short circuit persists, the output voltage will go through repeated

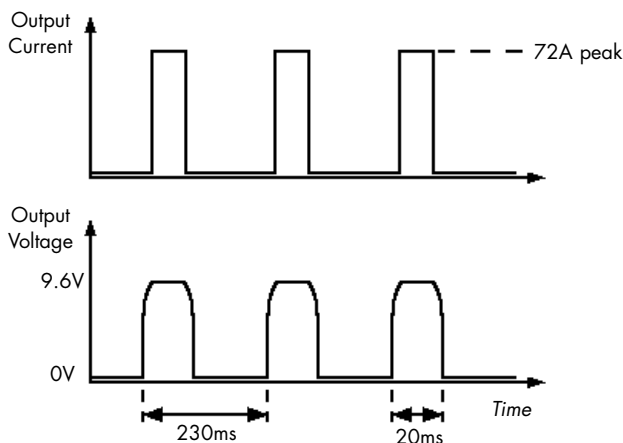


Figure D: Output Short Circuit and Auto-Resetting protection diagram (not to scale)

cycles of shutdown and restart with a duty cycle of 9% (On) and 91% (Off) respectively. The *BusQor* module returns (auto resetting) to normal operation once the short circuit is removed. The *BusQor* is designed to survive in this mode indefinitely without damage and without human intervention.

In the Auto resetting mode, also referred to as “Hiccup” mode, the power drawn from the 48V input is about 5 Watts, most of which is dissipated into the external fault. It is important that copper traces and pads from the output circuit be designed to withstand the short term peaks, although the average current into the fault may be as low as 2A typical. See Figure 17 for appropriate waveform.

Over-Temperature Shutdown: A temperature sensor on the converter senses the average temperature of the module. The thermal shutdown circuit is designed to turn the converter off when the temperature at the sensed location reaches the Over-Temperature Shutdown value. It will allow the converter to turn on again when the temperature of the sensed location falls by the amount of the Over-Temperature Shutdown Restart Hysteresis value.

APPLICATION CONSIDERATIONS

Start-Up Inhibit Period: Figure E details the Start-Up Inhibit Period for the *BusQor* module. At time t_0 , when V_{in} is applied with On/Off pin asserted (enabled), the *BusQor* output begins to build up. Before time t_1 , when the input voltage is below the UVL threshold, the unit is disabled by the Input Under-Voltage Lockout feature. When the input voltage rises above the UVL threshold, the Input Under-Voltage Lockout is released, and a typical Startup Inhibit Period of 3ms is initiated. The output builds up to 90% or higher of the nominal voltage and stabilizes at the nominal value of 9.6V in a period of 6ms typical. The rise time from 0V to 90% is 2ms typical.

At time t_2 , when the On/Off pin is de-asserted (disabled), the *BusQor* output instantly drops to 0V. Fall time from 9.6V to 0V is dependent on output capacitance and any parasitic trace inductance in the output load circuit.

At time t_3 , when the On/Off pin is re-asserted (enabled), the *BusQor* module output begins to build up after the inhibit period of 4ms typical.

Refer to the Control Features section of the data sheet for details on enabling and disabling methods for N and P logic type modules.

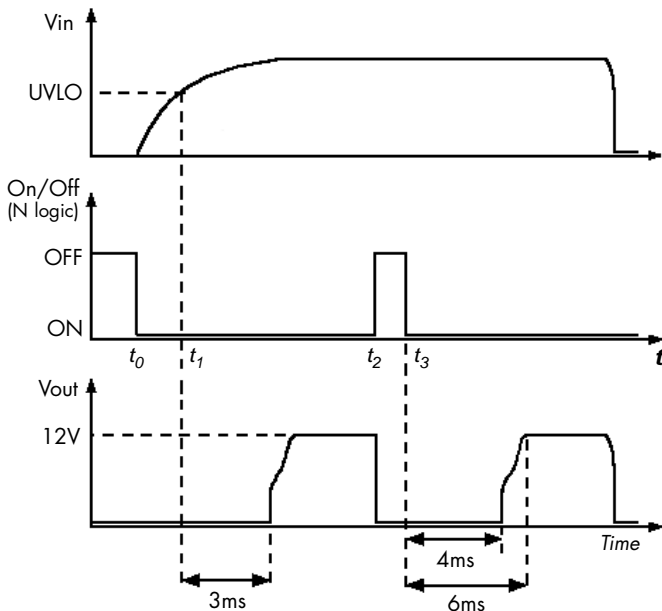


Figure E: Power Up/Down Diagram (not to scale) showing Start-Up Inhibit Period.

Keep Out Areas:

Component Keep Out Area: Keep out areas for components not referenced to the Primary circuit are shown in shaded areas in Figure F. The keep out areas shown are consistent with UL's requirements for Basic Insulation of 0.04" (40 mils) for Pollution degree 2. User should consult UL standards for other insulation classes and operating environments.

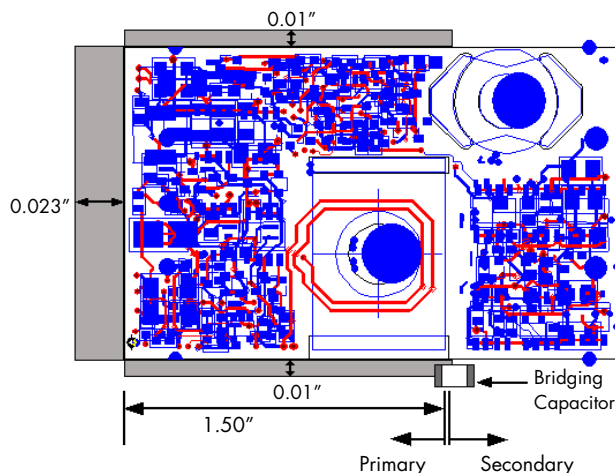


Figure F: Keep Out Areas for BusQor module

For applications that require mounting parts BELOW the BusQor module, one should be aware of potential high levels of electromagnetic interference, in addition to safety keep out. Users are advised to consult SynQor Applications engineering in such applications.

Copper Keep Out Area: Keep out areas shown in Figure F are to be observed for Top layer copper traces and vias. Internal layers buried one or more layers may be exempt, depending on the PCB material grade and thickness. Users are advised to consult UL standards for details.

All layers including top and bottom, are subject to the keep out areas shown around Primary pins of BusQor module. Actual keep outs along the surface (Creepage) may vary depending on the PCB material CTI. Users are advised to consult UL standards for details.

Bridging Components: Bridging components like EMI filter capacitors required to be placed as close as possible to the BusQor module for optimum performance must observe the clearance/creepage requirements of 0.04" (40 mils) between pads to maintain compliance to UL standards for the overall power system.

Note: Referenced keep out widths are adequate to withstand UL's Basic Insulation Dielectric strength tests for approved PCB materials. Applications requiring Double or Reinforced insulation must double the keep out widths shown in Figure F. Keep out areas shown have standard margins above UL's minimum requirements.

Output Load Current Calculation: The BusQor series allows the converter output load to be measured without adding a current loop or external shunt resistor to the designer's PCB board under test. On the top side of the BusQor converter is a current sense resistor as shown in Figure G. The output load current is proportional to the voltage drop across this sense resistor. This calculation is detailed below.

A current sense resistor referenced to the primary input is used in the equation below to calculate the output load current.

$$I_{load} = (V_{Rsense(load)} - V_{Rsense(no\ load)}) \times 3333$$

where:

$$I_{load} = \text{output load current}$$

$$V_{Rsense(load)} = \text{voltage across the sense resistor with converter under load}$$

$$V_{Rsense(no\ load)} = \text{voltage across the sense resistor with converter at zero load}$$

Input: 35-55 V
Output: 9.6 V
Current: 43 A
Package: Quarter-brick

The number 3333 is a "Load Current Scale Factor" for this product, valid only for $V_{in} = 48V$. Hence, measurement should be made at this input voltage.

The voltage drop across the sense resistor is about 13mV at full load of 43A. Therefore, proper measuring techniques must be used to ensure accuracy. A calibrated DMM set to 300mV is acceptable. Since this measurement is done on the Primary area of the converter, a slight non-linearity may be observed over the load current range. Using the Scale Factor referenced above, the error may be on the order of 4%. For more detailed information consult the application note on SynQor's website titled "Output Load Current Calculations".



Figure G: Location of Sense Resistor

Current Sharing: BusQor modules are designed to operate in parallel without the use of any external current share circuitry. A typical circuit for paralleling two BusQor modules is shown in Figure H. An output capacitor is recommended across each module and located close to the converter for optimum filtering and noise control performance. Dedicated input inductors are recommended but are considered optional. Input capacitors must be located close to the converter module. PCB layout in the input circuit should be such that high frequency ripple currents of each module is restricted to a loop formed by the input capacitors and the input terminals of the BusQor module. See Figure K for details on PCB layout. Contact SynQor application engineering for further assistance on PCB trace design.

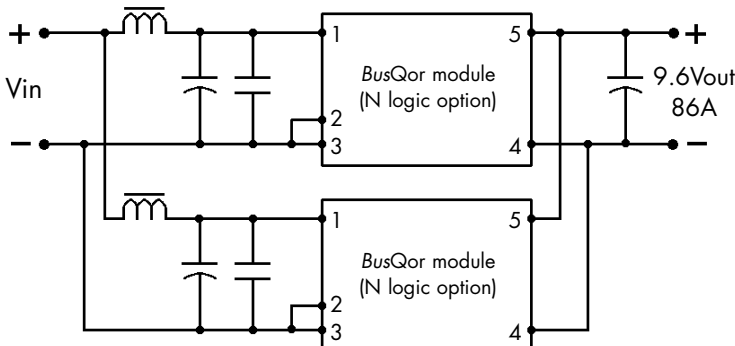


Figure H: BusQor Output Paralleling for increased current output.

The current share performance of two paralleled modules is illustrated in the graph in Figure J. In this graph the percent deviation from ideal sharing (50%) is plotted for each module versus the total output load current at 48Vin.

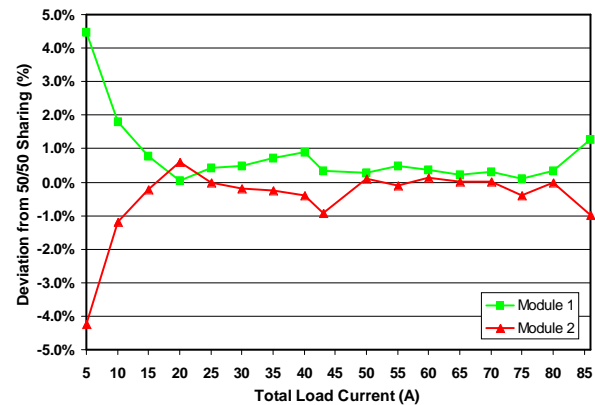


Figure J: Current share performance of 2 paralleled modules

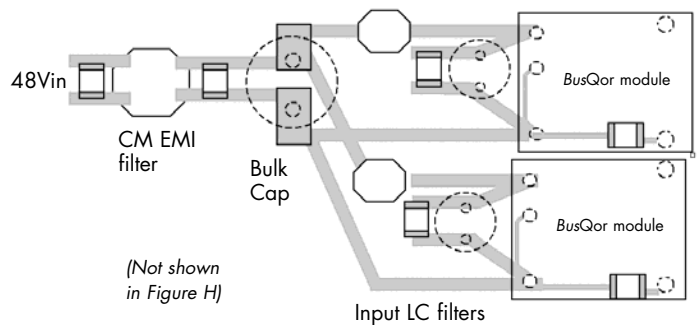


Figure K: Recommended PCB layout for input circuit

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

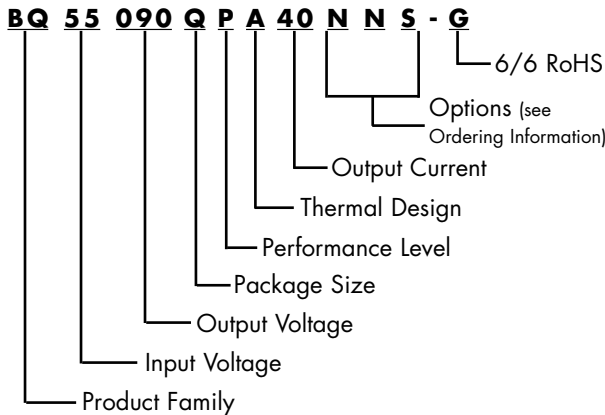


Technical Specification

Input: 35-55 V
Output: 9.6 V
Current: 43 A
Package: Quarter-brick

PART NUMBERING SYSTEM

The part numbering system for SynQor's BusQor DC bus converters follows the format shown in the example below.



The first 12 characters comprise the base part number and the last 3 characters indicate available options. Although there are no default values for enable logic and pin length, the most common options are negative logic and 0.145" pins. These part numbers are more likely to be readily available in stock for evaluation and prototype quantities. A "-G" suffix indicates the product is 6/6 RoHS compliant.

Application Notes

A variety of application notes and technical white papers can be downloaded in pdf format from our [website](#).

PATENTS (additional patent applications may be filed)

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

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

Contact SynQor for further information:

Phone: 978-849-0600
Toll Free: 888-567-9596
Fax: 978-849-0602
E-mail: power@synqor.com
Web: www.synqor.com
Address: 155 Swanson Road
 Boxborough, MA 01719
 USA

ORDERING INFORMATION

The tables below show the valid model numbers and ordering options for converters in this product family. When ordering SynQor converters, please ensure that you use the complete 15 character part number consisting of the 12 character base part number and the additional 3 characters for options. A "-G" suffix indicates the product is 6/6 RoHS compliant.

Model Number	Input Voltage	Output Voltage	Max Output Current
BQ55090QPA40 xyz -G	35 - 55 V	9.6 V	43 A

The following option choices must be included in place of the x y z spaces in the model numbers listed above.

Options Description: x y z		
Enable Logic	Pin Length	Feature Set
P - Positive N - Negative *	K - 0.110" N - 0.145" R - 0.180" Y - 0.250"	S - Standard

* Consult the factory before ordering the P logic option.

Warranty

SynQor offers a three (3) year limited warranty. Complete warranty information is listed on our [website](#) or is available upon request from SynQor.

Information furnished by SynQor is believed to be accurate and reliable. However, no responsibility is assumed by SynQor for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SynQor.