

Features

- Wide 2 : 1 Input Voltage Range(4.5~9V,9~18V,18~36V,36~75V)
- Input / Output Isolation Voltage: 1.5K VDC
- Extended Operating Temperature Range: -40°C to +85°C
- Output Short Circuit Protection:
Continuous & Auto Recovery
- Over Voltage Protection: Clamp Mode
- UL94V-0 Package Material
- Lead Free Design, RoHS Compliant
- 24pin DIP Package with Industry-Standard Footprint
- Customer Design Available
- Safety Standard / Approval : IEC / EN 60950-1



Description

The BQA3R Series are isolated 3W DC/DC converters. Designed with highly efficiency, allow the operating temperature range of these units to be -40°C to +85°C in a 24 pin DIP package with industry-standard footprint. Further features include wide 2 : 1 input voltage range, short-circuit protection and over voltage protection.

Applications

These converters are well suitable for battery operated equipment, measurement equipment, telecom, wireless network, Industry control system, everywhere where isolated, tightly regulated voltages and compact size are required.

Technical Specification

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

Model Number	Input Voltage Range	Output Voltage (V)	Output Current (mA)		Input Current (mA)		Eff. ⁽²⁾ (%)	Capacitive Load, max. ⁽³⁾ (uF)
			Min. Load ⁽¹⁾	Full. Load	No Load	Full Load		
BQA3-05S0R	4.5~9V Nominal:5V	3.3	0	600	46	552	76	4000
BQA3-05S1R		5	0	500	44	646	81	4000
BQA3-05S2R		12	0	250	62	769	82	4000
BQA3-05S3R		15	0	200	67	760	83	4000
BQA3-05D1R		±5	0	±250	55	638	82	1000
BQA3-05D2R		±12	0	±125	83	766	82	1000
BQA3-05D3R		±15	0	±100	89	765	82	1000
BQA3-12S0R	9~18V Nominal:12V	3.3	0	600	26	223	78	4000
BQA3-12S1R		5	0	500	24	263	83	4000
BQA3-12S2R		12	0	250	35	314	84	4000
BQA3-12S3R		15	0	200	36	311	84	4000
BQA3-12D1R		±5	0	±250	29	262	83	1000
BQA3-12D2R		±12	0	±125	44	313	84	1000
BQA3-12D3R		±15	0	±100	59	317	83	1000
BQA3-24S0R	18~36V Nominal:24V	3.3	0	600	20	112	78	4000
BQA3-24S1R		5	0	500	23	133	82	4000
BQA3-24S2R		12	0	250	26	157	84	4000
BQA3-24S3R		15	0	200	26	156	84	4000
BQA3-24D1R		±5	0	±250	22	133	83	1000
BQA3-24D2R		±12	0	±125	30	159	83	1000
BQA3-24D3R		±15	0	±100	40	160	82	1000
BQA3-48S0R	36~75V Nominal:48V	3.3	30	600	10	57	76	4000
BQA3-48S1R		5	0	500	9	67	81	4000
BQA3-48S2R		12	0	250	11	79	83	4000
BQA3-48S3R		15	0	200	12	79	83	4000
BQA3-48D1R		±5	0	±250	10	67	82	1000
BQA3-48D2R		±12	0	±125	14	79	82	1000
BQA3-48D3R		±15	0	±100	18	80	82	1000

Input Specifications			
Input Voltage	5V nominal input		4.5-9V
	12V nominal input		9-18V
	24V nominal input		18-36V
	48V nominal input		36-75V
Input filter			Pi Type
Input surge voltage (100ms max.)	5V input		10V
	12V input		25V
	24V input		50V
	48V input		100V
Input reflected ripple current	Nominal Vin and full load		100mA _{p-p} max.
Start up time	Nominal Vin and constant resistive load		100ms max.
Environmental Specifications			
Operating ambient temperature		-40 °C to +85 °C (with derating)	
Maximum case temperature		+90 °C	
Storage temperature range		-40 °C to +125 °C	
Relative humidity		5% to 95% RH	
Temperature coefficient		±0.02% / °C max.	
Output Specifications			
Output power		3 Watts max.	
Voltage accuracy	Full load and nominal Vin		±1%
Minimum load		See table	
Line Regulation	LL to HL at full load		±0.5%
Load Regulation	25% load to full load	Single	±0.5%
	Balanced load	Dual	±0.5%
	Unbalanced load 25% to 100% full load		±3%
Ripple and Noise	20MHz bandwidth		60mV _{p-p} max.
Over voltage protection (Zener Diode Clamp)	3.3V _{out} models		3.9V
	5V _{out} models		6.2V
	12V _{out} models		15V
	15V _{out} models		18V
Capacitive load		See table	
Over load protection	% of full load at nominal input		110% typ.
Short circuit protection		Continuous, automatic recovery	
Transient response settling time	50% load step change		46ms max.
Transient response over shoot	di/dt=0.8A/μs		≤ ±5% of Vo

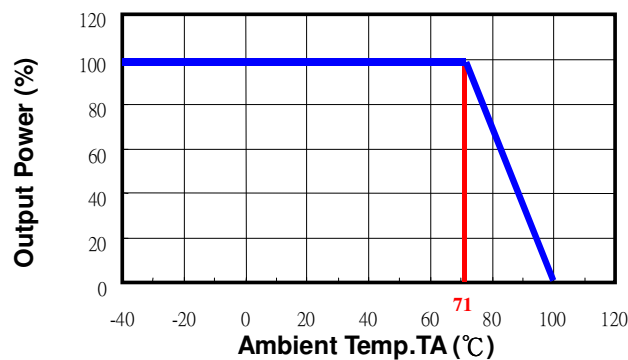
General Specifications

Efficiency	Nominal input	See table
Isolation voltage	Input to output	1500VDC
Isolation resistance	500VDC	10^9 Ohms min.
Isolation capacitance		280pF typ.
Switching frequency		150kHz typ.
Reliability, calculated MTBF		1.1×10^6 Hrs

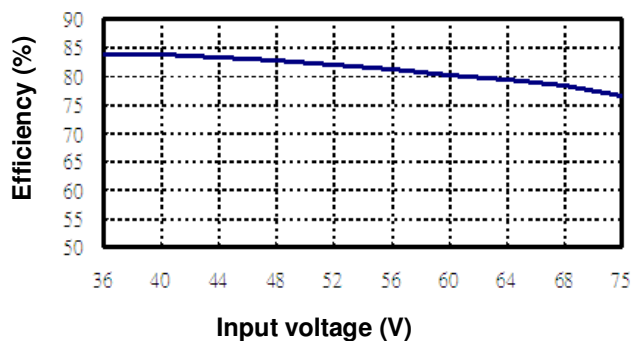
Physical Specifications

Case material	Non-conductive black plastic
Base material	Non-conductive black plastic
Potting material	Silicon rubber (UL94V-0)
Dimensions	1.25 × 0.80 × 0.40 Inches (31.8 × 20.3 × 10.2 mm)
Weight	12.8g (0.45oz) (typical)

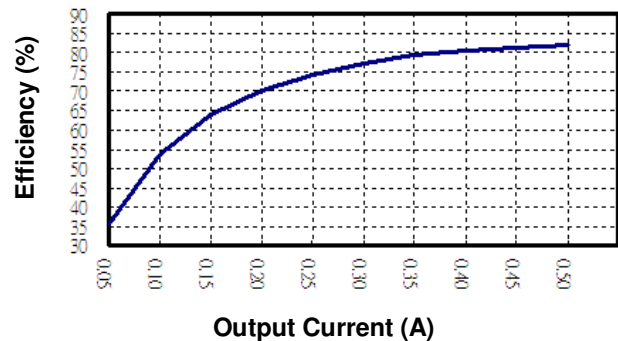
BQA3R Series
Power Derating Curve⁽⁴⁾



BQA3-48S1R
Input voltage vs. Efficiency

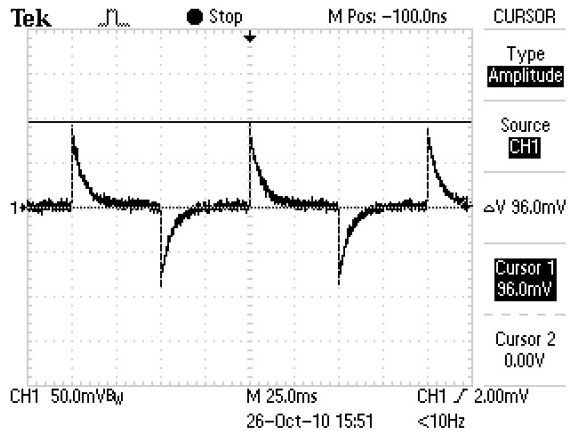


BQA3-48S1R
Output Current vs. Efficiency



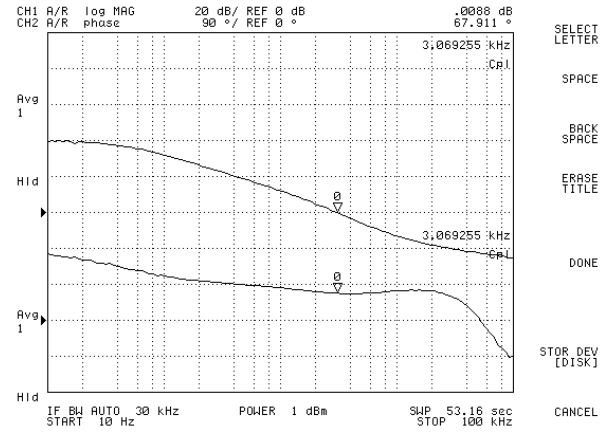
BQA3-48S1R

Transient Response at 50%~100% Max Load



BQA3-48S1R

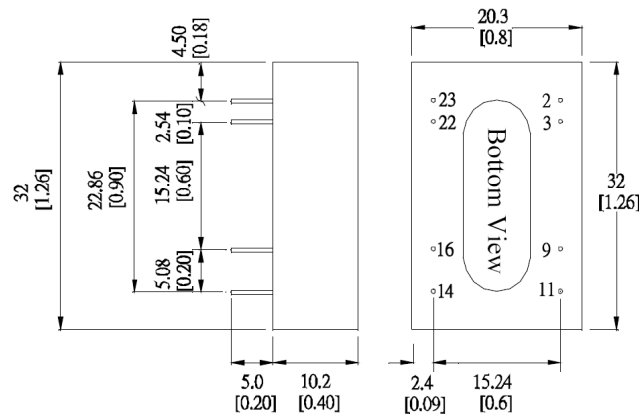
Loop Gain & Phase at Vi=48V, Full Load



Note

1. Io below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. For each output.
4. Based on BQA3-48S1R.

Mechanical Dimensions

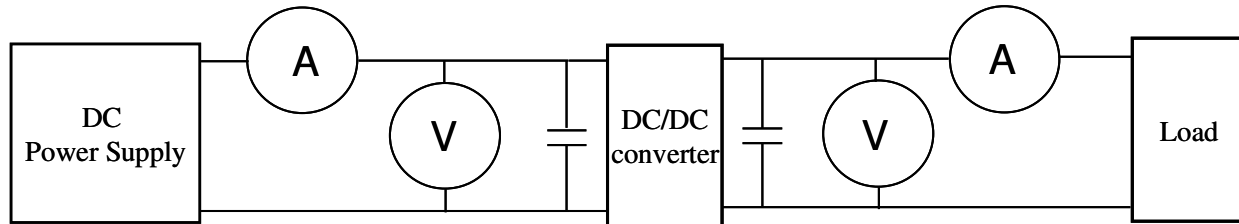


Unit: mm [inch]
Tolerance: ±0.5 [0.02]

Pin Assignment		
Pin	Single	Dual
2	-Vin	-Vin
3	-Vin	-Vin
9	No pin	Common
11	No con.	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

Test Configurations

All specifications are typical at nominal input, full load and 25 °C unless otherwise stated.



- ⊙ DC Power Supply: It offers a wide voltage and current range precisely.
- ⊙ Current meter (A): Accuracy → 200μA ~ 200mA 4 ranges $\pm(0.2\% \text{ rdg} + 2 \text{ digits})$
2000mA ~ 20A 2 ranges $\pm(0.3\% \text{ rdg} + 2 \text{ digits})$.
- ⊙ Voltage meter (V): Accuracy → $\pm(0.03\% \text{ rdg} + 4 \text{ digits})$.
- ⊙ Load: At full load.
- ⊙ Wires: The resistance of the wires must be small.

1. Input voltage range: Narrow input voltage range ($\pm 10\%$)、wide input voltage range (2:1 and 4:1)。

EX: Narrow input voltage range ($\pm 10\%$)

5V nominal input	→	4.5~5.5V
12V nominal input	→	10.8~13.2V
24V nominal input	→	21.6~26.4V

Wide input voltage range 2:1

5V nominal input	→	4.5~9V
12V nominal input	→	9~18V
24V nominal input	→	18~36V
48V nominal input	→	36~75V

Wide input voltage range 4:1 (W)

24V nominal input	→	9~36V
48V nominal input	→	18~75V

2. Input power :

$$P_{in} = V_{in} \times I_{in}$$

V_{in} : Input voltage

I_{in} : Input current

3. Output power :

$$P_{out} = V_{out} \times I_{out}$$

V_{out} : Output voltage

I_{out} : Output current

4. Efficiency :

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$$

P_{out} : Output power

P_{in} : Input power

5. Voltage accuracy:

$$\frac{|V_{out} - V_{out(nominal)}|}{V_{out}} \times 100\%$$

V_{out} : Output voltage

$V_{out(nominal)}$: Nominal output voltage

6. Line regulation: (1) Wide input voltage range and regulated output voltage series.

$$\frac{|V_{out(LL)} - V_{out(HL)}|}{V_{out(LL)}} \times 100\%$$

LL: Low Line input voltage
HL: High Line input voltage

- (2) Narrow input voltage range ($\pm 10\%$) and unregulated output voltage series.

$$\text{Line regulation} = \left| \frac{\Delta V_{out}}{\Delta V_{in}} \right|$$

$$\Delta V_{out} = \frac{V_{out(+10\%)} - V_{out(-10\%)}}{V_{out}} \times 100\%$$

$V_{out(+10\%)}$: Output voltage at $V_{in} = 1.1 \times V_{in}(\text{nominal})$ & full load

$V_{out(-10\%)}$: Output voltage at $V_{in} = 0.9 \times V_{in}(\text{nominal})$ & full load

V_{out} : Output voltage at $V_{in} = V_{in}(\text{nominal})$ & full load

$$\Delta V_{in} = \frac{V_{in(+10\%)} - V_{in(-10\%)}}{V_{in}(\text{nominal})} \times 100\%$$

$V_{in(+10\%)}$: Input voltage = $1.1 \times V_{in}(\text{nominal})$

$V_{in(-10\%)}$: Input voltage = $0.9 \times V_{in}(\text{nominal})$

$V_{in}(\text{nominal})$: Nominal Input voltage

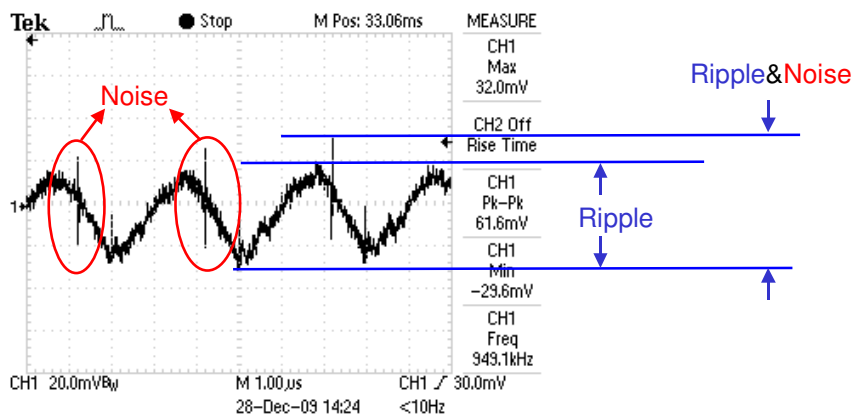
7. Load regulation :

$$\frac{|V_{out(FL)} - V_{out(NL)}|}{V_{out(FL)}} \times 100\%$$

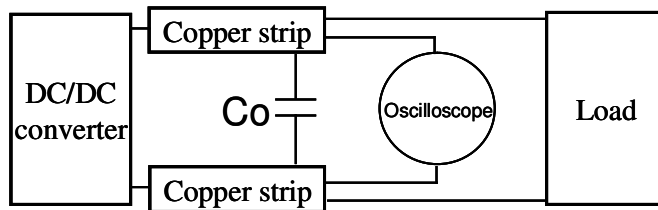
$V_{out(FL)}$: Output voltage at full load

$V_{out(NL)}$: Output voltage at 25% full load or 10% full load

8. Ripple and Noise: as shown below. The bandwidth is 0-20MHz.

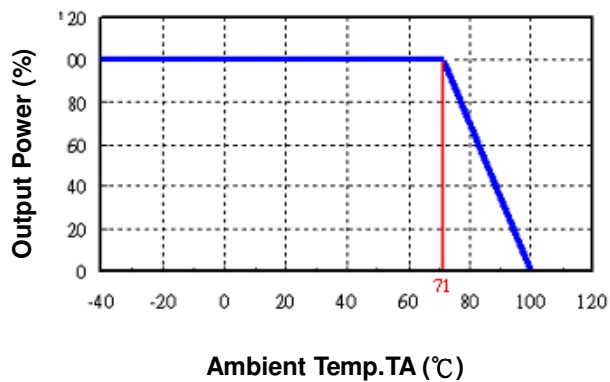


Output Ripple&Noise measurement test circuit: as shown below.



C_o : usually 0.47uF.

9. [Temperature derating curve](#): The DC-DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



10. [Switching frequency](#): The nominal operating frequency of the DC-DC converters.
11. [Input to output isolation](#): The dielectric breakdown strength test between input and output circuits. This is the isolation voltage the device is capable of withstanding for a specified time, usually 1 second or 1 minute.