

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
- 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/EN60950-1



Description

The BOA5R 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		
BOA5-05S0R	4.5~9V Nominal:5Vdc	3.3	0	1200	121	1131	74	6800
BOA5-05S1R		5	0	1000	103	1352	78	6800
BOA5-05S2R		12	0	500	208	1622	78	1000
BOA5-05S3R		15	0	400	213	1600	79	1000
BOA5-05D1R		±5	0	±500	143	1333	79	±1000
BOA5-05D2R		±12	0	±250	315	1644	77	±1000
BOA5-05D3R		±15	0	±200	235	1600	79	±1000
BOA5-12S0R	9~18V Nominal:12Vdc	3.3	60	1200	61	459	76	6800
BOA5-12S1R		5	50	1000	50	549	80	6800
BOA5-12S2R		12	25	500	54	633	83	6800
BOA5-12S3R		15	20	400	56	625	84	6800
BOA5-12D1R		±5	±25	±500	62	556	79	±1000
BOA5-12D2R		±12	±12.5	±250	57	633	83	±1000
BOA5-12D3R		±15	±10	±200	59	625	84	±1000
BOA5-24S0R	18~36V Nominal:24Vdc	3.3	60	1200	32	226	77	6800
BOA5-24S1R		5	50	1000	39	267	82	6800
BOA5-24S2R		12	25	500	40	309	85	6800
BOA5-24S3R		15	20	400	38	309	85	6800
BOA5-24D1R		±5	±25	±500	42	267	82	±1000
BOA5-24D2R		±12	±12.5	±250	41	313	84	±1000
BOA5-24D3R		±15	±10	±200	39	309	85	±1000
BOA5-48S0R	36~75V Nominal:48Vdc	3.3	60	1200	17	115	76	6800
BOA5-48S1R		5	50	1000	12	135	81	6800
BOA5-48S2R		12	25	500	13	154	85	6800
BOA5-48S3R		15	20	400	14	154	85	6800
BOA5-48D1R		±5	±25	±500	16	135	81	±1000
BOA5-48D2R		±12	±12.5	±250	15	154	85	±1000
BOA5-48D3R		±15	±10	±200	16	154	85	±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
	5V input		10V
	12V input		25V
Input surge voltage (100ms max.)	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			6 Watts max.
Voltage accuracy	Full load and nominal Vin		±1%
Minimum load			See table
Line Regulation	LL to HL at full load		±0.5%
	25% load to full load	Single	±0.5%
Load Regulation	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		45ms max.
Transient response over shoot	di/dt=0.8A/μs		≤ ±5% of Vo

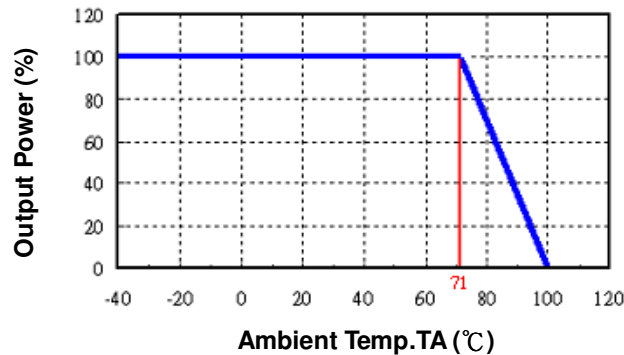
General Specifications

Efficiency	Nominal input	See table
Isolation voltage	Input to output	1500VDC
Isolation resistance	500VDC	10^9 Ohms min.
Isolation capacitance		330pF typ.
Switching frequency		300kHz typ..
Reliability, calculated MTBF		1.1×10^6 Hrs

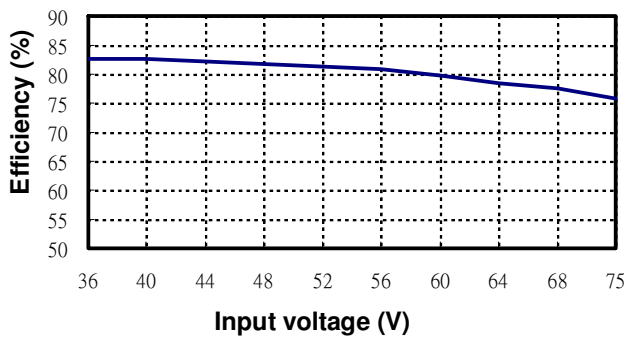
Physical Specifications

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	17.8g (0.63oz) (typical)

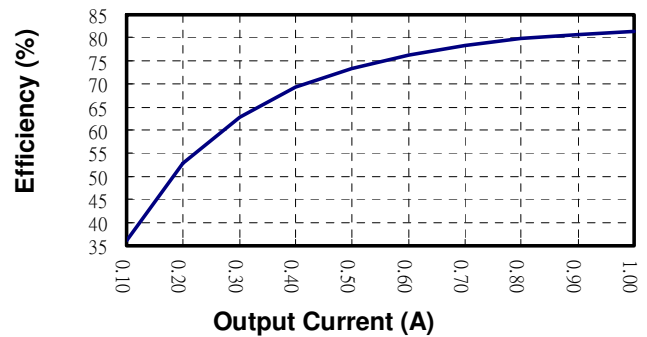
Power Derating Curve



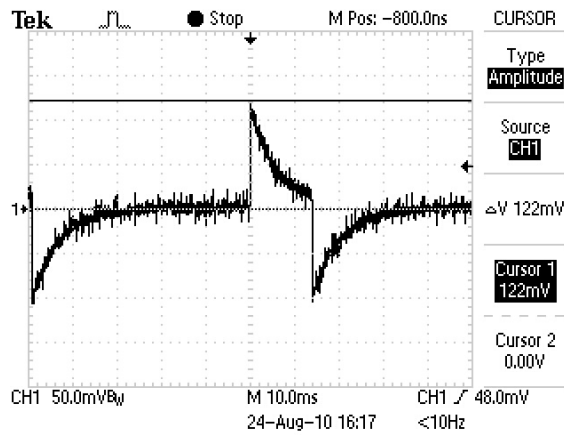
BOA5-48S1R
Input voltage vs. Efficiency



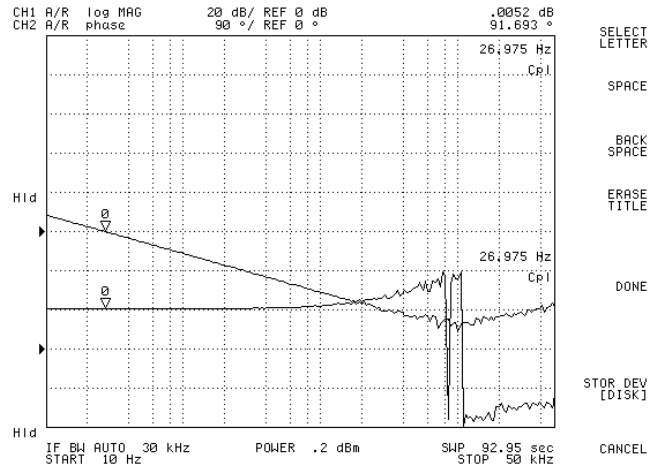
BOA5-48S1R
Output Current vs. Efficiency



Transient Response at 50%~100% Max Load



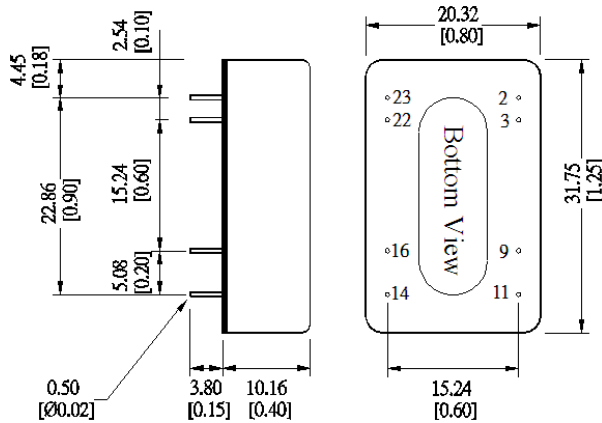
Loop Gain & Phase at Vi=48V, Full Load



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 BOA5-48S1R.

Mechanical Dimensions



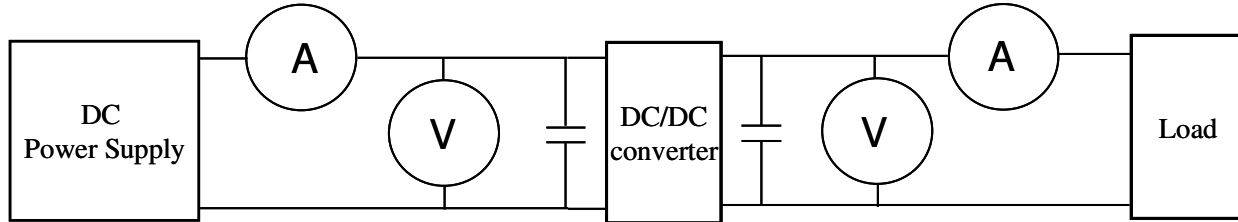
Unit: mm [inch]
Tolerance: ±0.5[0.02]

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

Specifications subject to change without notice.

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 ±(0.2% rdg + 2 digits)
2000mA ~ 20A 2 ranges ±(0.3% rdg + 2 digits).
- ⊙Voltage meter (V): Accuracy → ±(0.03% rdg + 4 digits).
- ⊙Load: At full load.
- ⊙Wires: The resistance of the wires must be small.

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

EX: Narrow input voltage range (±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

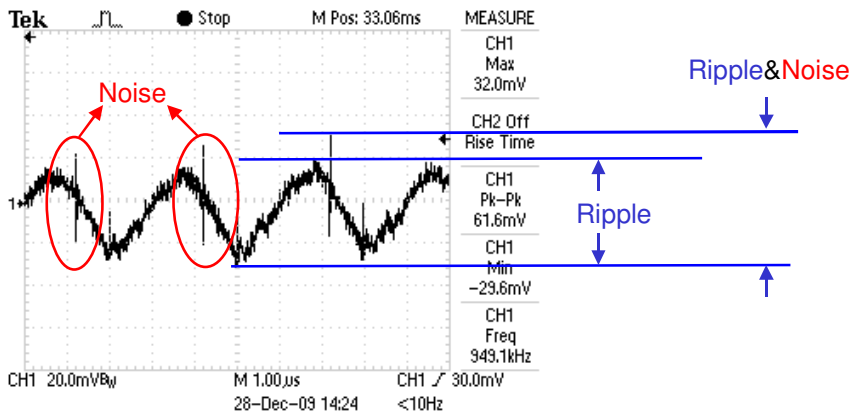
7. Load regulation :

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

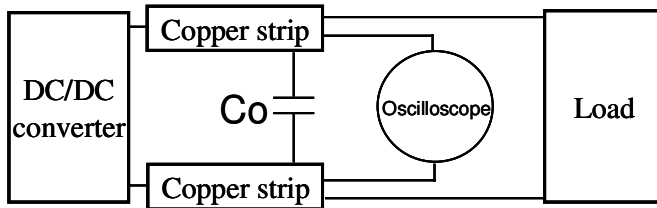
$V_{out(FL)}$: Output voltage at full load

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

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

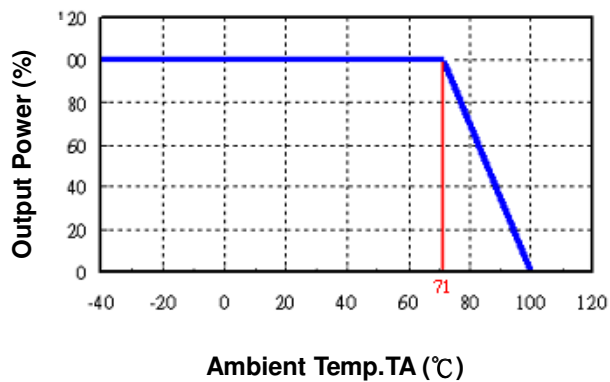


Output Ripple&Noise measurement test circuit: as shown below.



Co: 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.