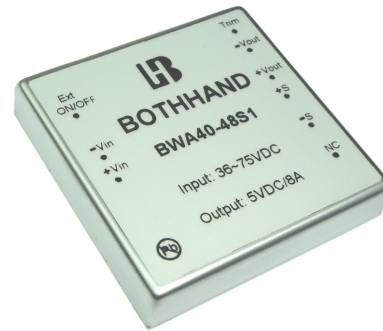


### Features

- Wide 2 : 1 Input Voltage Range (9~18V,18~36V,36~75V)
- Remote On/Off
- Input / Output Isolation Voltage: 1.5K VDC
- High Efficiency up to 90%
- Output Short Circuit Protection:  
Hiccup & Auto Recovery
- Over Voltage Protection: Clamp Mode
- Over Temperature Protection
- Shielded Metal Case with Insulated Baseplate
- Lead Free Design, RoHS Compliant
- Adjustable Output Voltage
- Optional Heat-sink
- Customer Design Available
- Safety Standard Approval : IEC / EN 60950-1



### Description

The BWA40 Series are isolated 40W DC/DC converters. Designed with highly efficiency, allow the operating temperature range of these units to be -40°C to +85°C in a 50.8×50.8×10.2mm shielded metal case. Further features include wide 2 : 1 input voltage range, remote on/off control, short-circuit protection, over voltage protection and over temperature 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. <sup>(2)</sup> (%)	Capacitive Load, max. <sup>(3)</sup> (uF)
			Min. Load <sup>(1)</sup>	Full. Load	No Load	Full Load		
BWA40-12S0	9~18V Nominal:12V	3.3	0	8000	158	2683	86	38000
BWA40-12S1		5	0	8000	166	3968	88	28000
BWA40-12S2		12	0	3300	48	3976	87	5000
BWA40-12D2		±12	0	±1800	144	4444	85	2200
BWA40-12D3		±15	0	±1400	133	4321	85	1800
BWA40-24S0	18~36V Nominal:24V	3.3	0	8000	79	1310	88	38000
BWA40-24S1		5	0	8000	100	1938	90	28000
BWA40-24S2		12	0	3300	34	1919	90	5000
BWA40-24D2		±12	0	±1800	66	2118	89	2200
BWA40-24D3		±15	0	±1400	67	2059	89	1800
BWA40-48S0	36~75V Nominal:48V	3.3	0	8000	56	655	88	38000
BWA40-48S1		5	0	8000	66	969	90	28000
BWA40-48S2		12	0	3300	18	959	90	5000
BWA40-48D2		±12	0	±1800	31	1047	90	2200
BWA40-48D3		±15	0	±1400	28	1017	90	1800

Input Specifications		
Input voltage	12V nominal input	9-18V
	24V nominal input	18-36V
	48V nominal input	36-75V
Input filter		Pi type
Input surge voltage (100ms max.)	12V input	25V
	24V input	50V
	48V input	100V
Input reflected ripple current	Nominal Vin and full load	100mA <sub>p-p</sub> typ.
Start up time	Nominal Vin and constant resistive load	78ms typ.
Remote ON/OFF	Converter: ON	Open or $3.5V < V_r < 12V$
	Converter: OFF	Short <sup>(4)</sup> or $0V < V_r < 0.7V$
Sourcing current of remote control pin	Nominal Vin	< 0.2 mA
Idle input current (at Remote OFF state)	Nominal Vin	< 20 mA
Environmental Specifications		
Operating ambient temperature	-40°C to +85°C (with derating)	
Maximum case temperature	+100°C	
Storage temperature range	-55°C to +105°C	
Relative humidity	95% RH max.	
Temperature coefficient	±0.02% / °C max.	
Output Specifications		
Output power	43.2 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)	Single outputs	50mV <sub>p-p</sub> max.
	Dual outputs	85mV <sub>p-p</sub> max.
Over voltage protection (Zener Diode Clamp)	3.3V <sub>out</sub> models	3.9V
	5V <sub>out</sub> models	6.2V
	12V <sub>out</sub> models	15V
	15V <sub>out</sub> models	18V
Capacitive load	See table	
Over load protection	% of full load at nominal input	110% min.
Thermal shutdown	115°C typ.	
Short circuit protection	Hiccup, automatic recovery	

Transient response settling time	50% load step change	300µs typ.
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Transient response over shoot	di/dt=0.8A/µs	≤ ±5% of Vo
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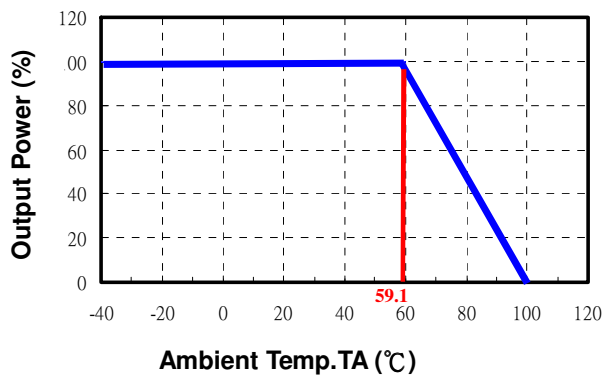
### General Specifications

Efficiency	Nominal input	See table
Isolation voltage	Input to output	1500VDC
Isolation resistance	500VDC	10 <sup>9</sup> Ohms min.
Isolation capacitance		1200pF typ.
Switching frequency		300kHz typ.
Reliability, calculated MTBF		9.17 × 10 <sup>5</sup> Hrs

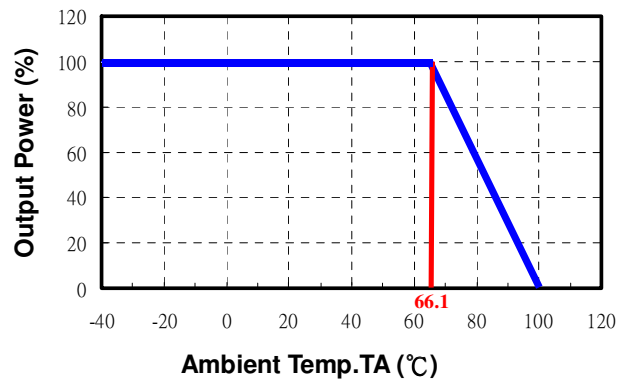
### Physical Specifications

Case material	Nickel-coated copper
Base material	FR4 PCB
Potting material	Silicon rubber (UL94 V-0)
Dimensions	2.00 × 2.00 × 0.40 Inch (50.8 × 50.8 × 10.2 mm)
Weight	60g (2.11oz) typ.

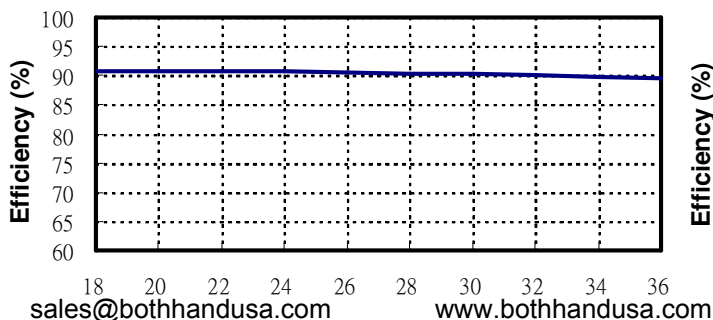
**BWA40 Series**  
Power Derating Curve without Heatsink<sup>(5)</sup>



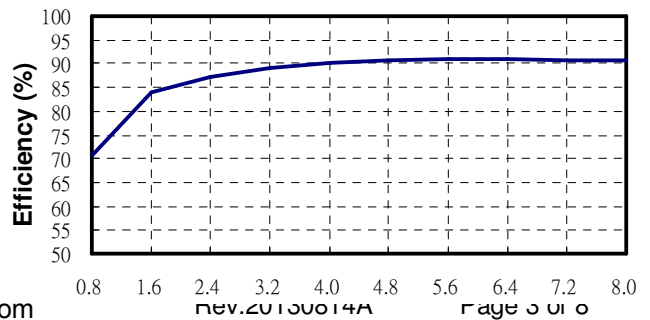
**BWA40 Series**  
Power Derating Curve with Heatsink<sup>(5)</sup>



**BWA40-48S1**  
Input voltage vs. Efficiency



**BWA40-48S1**  
Output Current vs. Efficiency



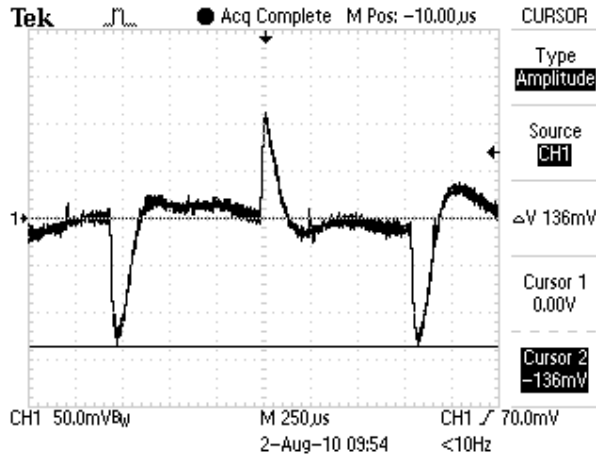
Input voltage (V)

Output Current (A)

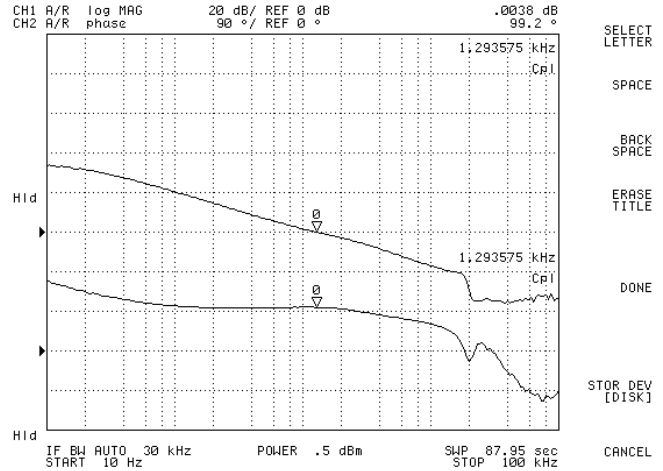
### BWA40-48S1

### BWA40-48S1

#### Transient Response at 50%~100% Max Load



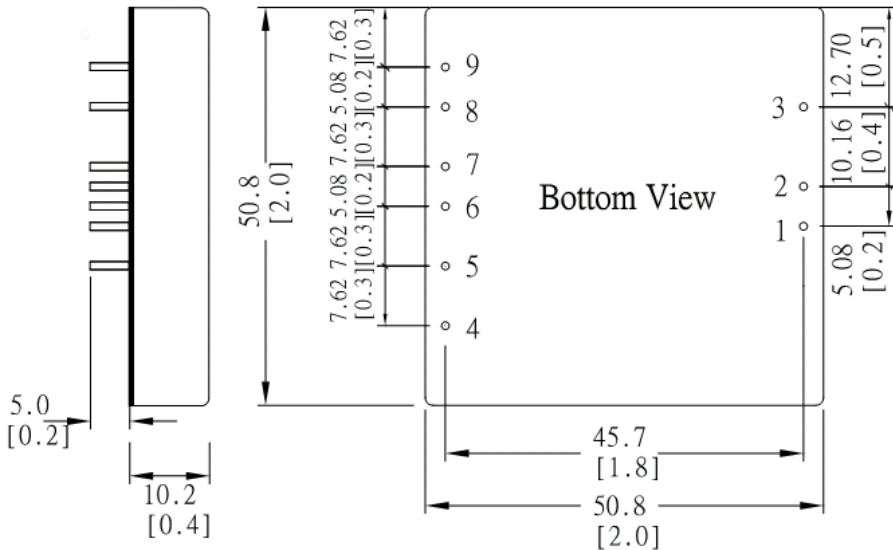
#### Loop Gain & Phase at Vi=48V, Full Load



#### 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. Short to -Vin (Pin 2).
5. Based on BWA40-48S1.

#### Mechanical Dimensions



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

#### Pin Assignment

Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	
4	No function	No pin
5	-Sense	+Vout
6	+Sense	Common
7	+Vout	Common
8	-Vout	-Vout
9	Trim	

Specifications subject to change without notice.

### Heat-sink (Option)

Material: Aluminum

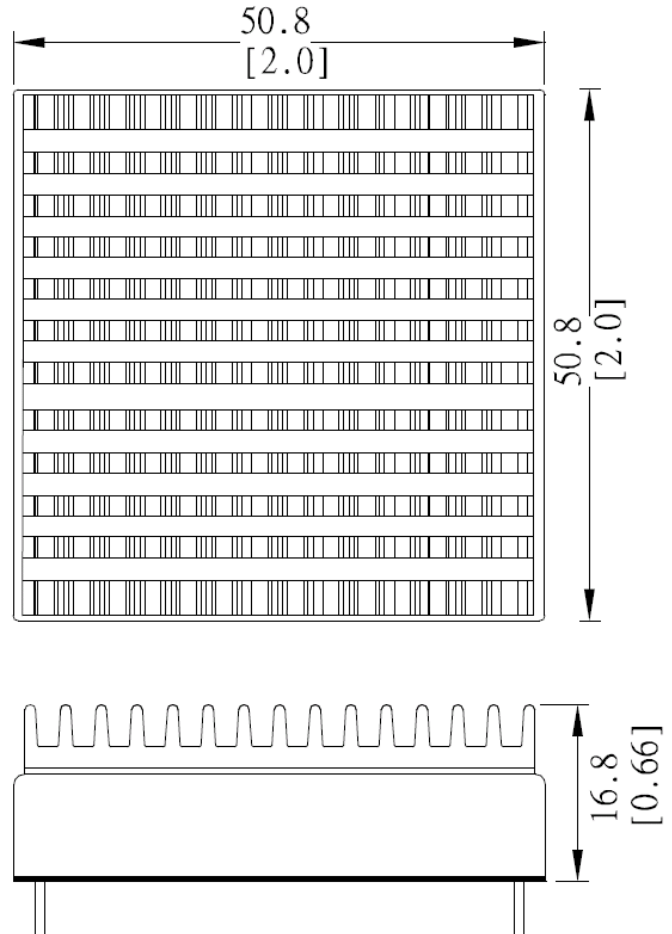
Weight: 19g (0.67oz) (without converter)

#### Note:

The product label on converter has to be removed before mounting the heat-sink.

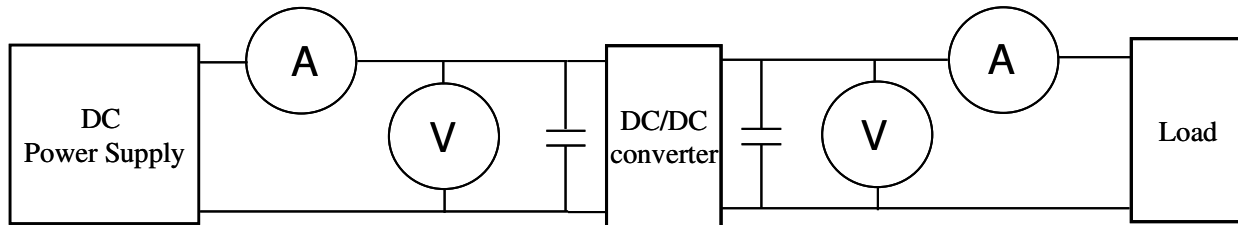
For volume orders, converters will be supplied with heat-sink already mounted. Please contact factory for quotation.

Separate heat-sinks are only available for prototypes and small quantity orders.



### 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

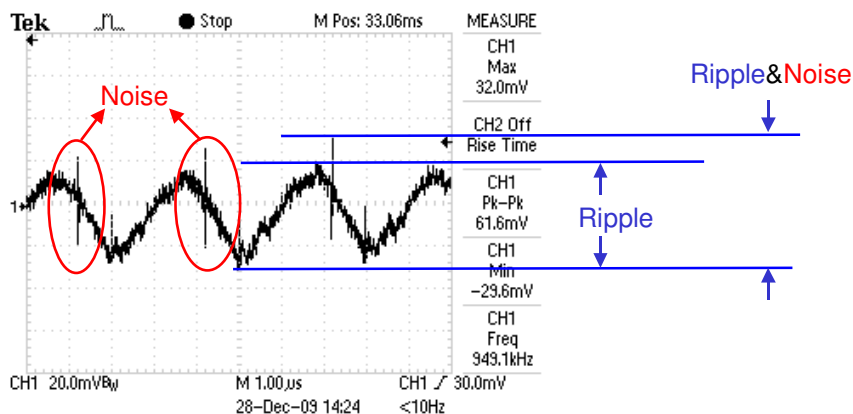
7. Load regulation :

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

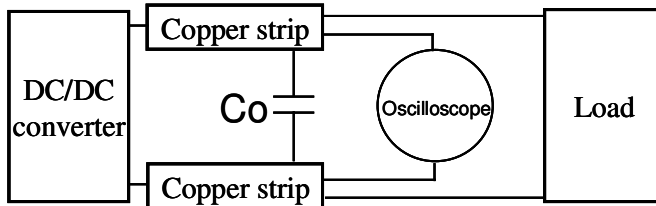
$V_{out(FL)}$ : Output voltage at full load

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

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

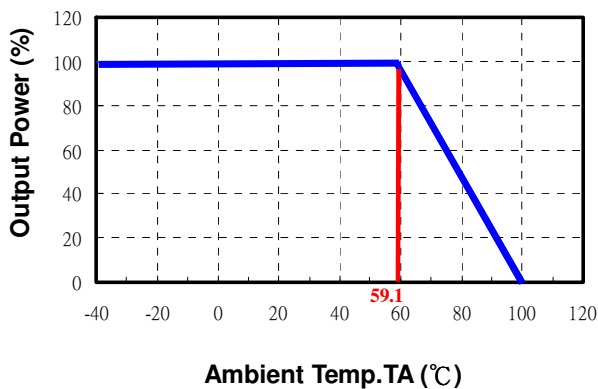


Output Ripple&Noise measurement test circuit: as shown below.



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.