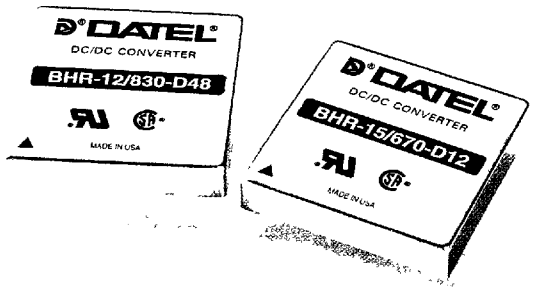
XHR SERIES



DATEL
INNOVATION and EXCELLENCE

Dual Output
BHR Models
Ruggedized, 2" x 2"
17-20 Watt, DC/DC Converters

Features

- Ruggedized design
- All metal-ceramic construction
- Low junction-to-baseplate thermal resistance
- Solder sealed, no potting compounds
- ±5, ±12 or ±15 Volt outputs
- Ultra-wide input voltage ranges: 9-36V or 18-72V
- Industry-standard pinouts
- No external components required
- Tight regulation, low ripple/noise
- Guaranteed efficiencies to 82%
- External V_{OUT} trim, remote on/off control
- Modifications and customs for OEM's

DATEL's new XHR Series DC/DC converters deliver a measure of cost-effective long-term reliability not previously available in commercial, off-the-shelf power converters. These DC/DC's combine the high efficiency and wide input range of DATEL's venerable XWR Series DC/DC's with a newly developed, all metal-ceramic, construction technique that eliminates the need for thermally-conductive potting compounds.

All electrical components are surface-mount soldered to a 60 mil (0.06"/ 1.52mm) ceramic baseplate for low junction-to-case thermal resistance. Package pins, instead of traditional butt soldering, are soldered through the baseplate via pre-cut holes. Pre-cutting prior to firing, as opposed to laser cutting after firing, eliminates micro cracks. The tin plated, steel cover is soldered to the baseplate creating a level of hermiticity not available in other commercial power modules. The bottom of the baseplate has a conductive layer that provides 6-sided shielding. It is also insulated so pc-card runs can pass beneath the package.

BHR Models are the dual-output devices in the XHR Series. They offer outputs of ±5, ±12 or ±15 Volts. Their ultra-wide (4:1) input voltage ranges are either 9-36V ("D12" models) or 18-72V ("D48" models). Line and load regulation are a tight ±0.4% max. and ±0.5% max., respectively. All devices guarantee that output ripple/noise will be less than 100mVp-p. Isolation voltage is guaranteed to be at least 500Vdc.

BHR devices carry industry-standard pinouts in packages whose outside dimensions are only slightly larger than the 2" x 2" standard. They can be subjected to mutually-agreed-upon, high-rel screening programs as necessary to satisfy your system's reliability requirements. Contact DATEL for additional details.

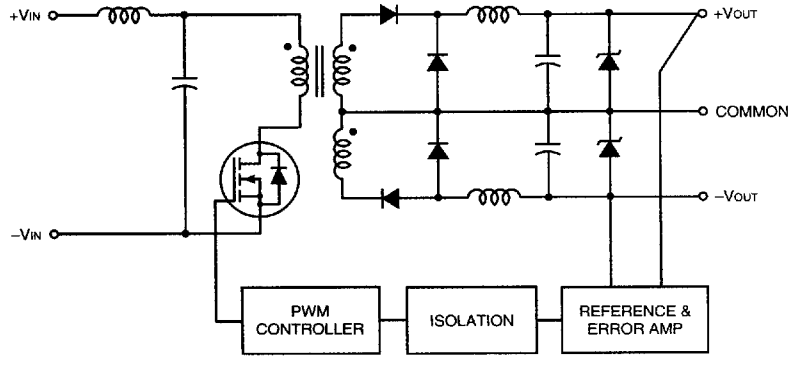


Figure 1. Simplified Schematic

Performance Specifications and Ordering Guide ①

Model	Output					Input			Efficiency (Min.)	Package (Case, Pinout)
	V_{OUT} (Volts)	I_{OUT} (mA, Max.)	Ripple/Noise ② (mVp-p, Max.)	Regulation (Max.) Line	Regulation (Max.) Load ③	V_{IN} Nom. (Volts)	Range (Volts)	I_{IN} ④ (mA, Max.)		
BHR-5/1700-D12	±5	±1700	100	±0.3%	±0.5%	24	9-36	40/1030	82%	C8, P7
BHR-5/1700-D48	±5	±1700	100	±0.4%	±0.5%	48	18-72	25/442	81%	C8, P7
BHR-12/830-D12	±12	±830	100	±0.3%	±0.5%	24	9-36	40/1041	81%	C8, P7
BHR-12/830-D48	±12	±830	100	±0.4%	±0.5%	48	18-72	25/517	81%	C8, P7
BHR-15/670-D12	±15	±670	100	±0.3%	±0.5%	24	9-36	40/1035	81%	C8, P7
BHR-15/670-D48	±15	±670	100	±0.4%	±0.5%	48	18-72	25/516	82%	C8, P7

① Typical at T_A = +25°C under nominal line voltage and full load conditions unless otherwise noted.
② 20MHz bandwidth
③ Balanced loads, 20% to 100% load.
④ Nominal line voltage, no load/full load conditions.

Part Number Structure

B HR - 12 / 830 - D48

Output Configuration:
B = Bipolar

Metal-Ceramic Construction
Wide Range Input

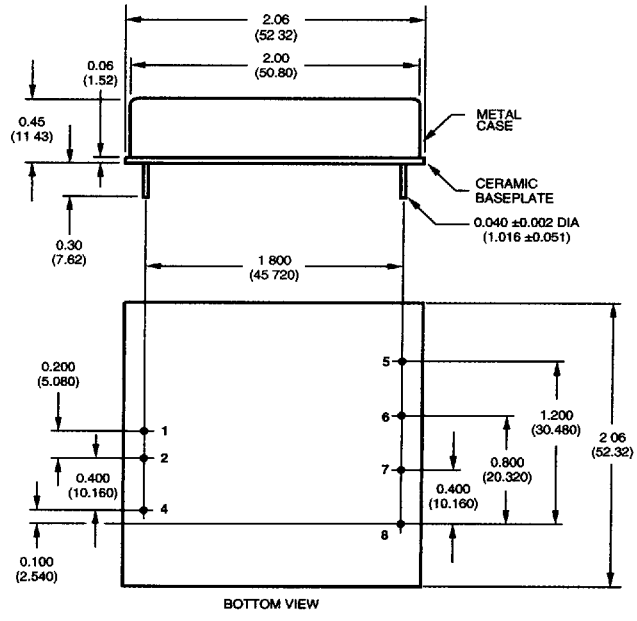
Nominal Output Voltage:
±5, ±12 or ±15 Volts

Maximum Output Current
in mA from each output

Input Voltage Range:
D12 = 9-36 Volts (24V nominal)
D48 = 18-72 Volts (48V nominal)

Mechanical Specifications

Case C8



I/O Connections	
Pin	Function P7
1	+Input
2	–Input
3	No Pin
4	Control
5	+Output
6	Common
7	–Output
8	Trim

Notes:

For "D12" models, the case is connected to pin 2 ($-V_{IN}$).

For "D48" models, the case is connected to pin 1 ($+V_{IN}$).

DATEL, Inc., 11 Cabot Boulevard, Mansfield, MA 02048-1194 (U.S.A.)
Tel: 508-339-3000 Fax: 508-339-6356 • For immediate assistance 800-233-2765

Performance/Functional Specifications

Typical @ T_A = +25°C under nominal line voltage and full load conditions unless noted ①

Input	
Input Voltage Range:	
"D12" Models	9-36 Volts (24V nominal)
"D48" Models	18-72 Volts (48V nominal)
Input Current	See Ordering Guide
Input Filter Type ②	Inductive
Overvoltage Shutdown:	
"D12" Models	40 Volts
"D48" Models	76 Volts
Reverse-Polarity Protection	Yes (Instantaneous, 10A maximum)
On/Off (Sync.) Control (Pin 4) ③	TTL high = off, low (or open) = on
Output	
V_{OUT} Accuracy (50% load):	
±5V Outputs	±1.5%, maximum
±12/15V Outputs	±1%, maximum
Temperature Coefficient	±0.02% per °C
Ripple/Noise (20MHz BW) ②	See Ordering Guide
Line/Load Regulation	See Ordering Guide
Efficiency	See Ordering Guide
Isolation Voltage	500Vdc, minimum
Isolation Capacitance	550pF
Current Limiting	Auto-recovery
Overvoltage Protection	Clamp, 2W transorb
Dynamic Characteristics	
Transient Response (50% load step)	200µsec max. to ±1.5% of final value
Switching Frequency	165kHz (±10kHz)
Environmental	
Operating Temperature (baseplate):	
Without Derating	–40 to +85°C
With Derating	to +100°C (See Derating Curves)
Storage Temperature	–55 to +125°C
Physical	
Dimensions	2.06" x 2.06" x 0.45" (51 x 51 x 11.4mm)
Shielding	6-sided
Case Connection:	
"D12" Models	Pin 2 ($-V_{IN}$)
"D48" Models	Pin 1 ($+V_{IN}$)
Case Material:	
Cover	Tin plated steel
Baseplate	Ceramic (0.06"/1.52mm)
Pin Material	Brass, solder coated
Weight	2.7 ounces (75.6 grams)

① These converters require 20% min loading to maintain specified regulation Operation under no-load conditions will not damage these devices, however, they may not meet all listed specifications.

② Application-specific internal input/output filtering can be added upon request. Contact DATEL

③ Applying a voltage to the Control pin when no input power is applied to the converter can cause permanent damage to the converter

Absolute Maximum Ratings

These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied. Storage temperatures have been verified for 168 hours.

Input Voltage:	
"D12" Models	44 Volts
"D48" Models	80 Volts
Input Reverse-Polarity Protection	Current must be <10A. Brief duration only. Fusing recommended.
Output Overvoltage Protection:	
±5V Outputs	±6.8 Volts, limited duration
±12V Outputs	±15 Volts, limited duration
±15V Outputs	±18 Volts, limited duration
Output Current	Current limited. Max. current and short-circuit duration model dependent
Storage Temperature	–55 to +125°C
Lead Temperature (soldering, 10sec.)	+300°C

Technical Notes

Floating Outputs

All outputs are floating. Any BHR model may be configured to produce an output of 10V, 24V or 30V (for ±5V, ±12V or ±15V models, respectively) by applying the load across the +Output and –Output pins (pins 5 and 7), with either output grounded. The Common pin (pin 6) should be left open. Minimum 20% loading is recommended under these conditions. The total output voltage span may be externally trimmed as described below.

Filtering and Noise Reduction

All BHR 17-20 Watt DC/DC Converters achieve their rated ripple and noise specifications without the use of external input/output capacitors. In critical applications, input/output ripple and noise may be further reduced by installing electrolytic capacitors across the input terminals and/or low-ESR tantalum or electrolytic capacitors across the output terminals. Output capacitors should be connected between their respective output pin (pin 5 or 7) and Common (pin 6) as shown in Figure 2. The caps should be located as close to the power converters as possible. Typical values are listed below. In most applications, using values greater than those listed will yield better results.

To Reduce Input Ripple

"D12" Models	20µF, 50V
"D48" Models	20-50µF, 100V

To Reduce Output Ripple

±5V Outputs	47µF, 10V, Low ESR
±12/15V Outputs	22µF, 20V, Low ESR

In critical, space-sensitive applications, DATEL can easily tailor the internal input/output filtering of these devices to meet your specific requirements. Contact us for additional details.

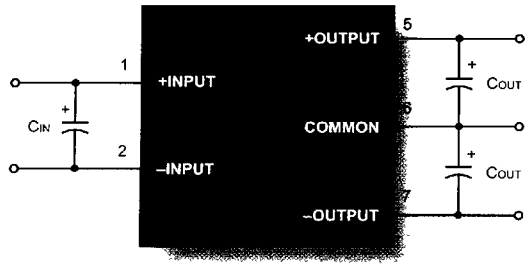


Figure 2. Using External Capacitors to Reduce Input/Output Noise/Ripple

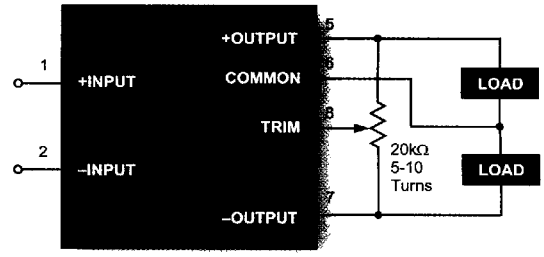


Figure 3a. Trim Connections Using a Trimpot

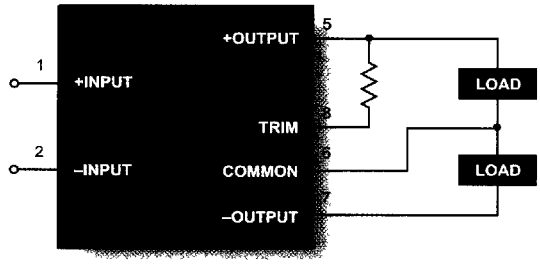


Figure 3b. Fixed-Value Trim Down Resistor

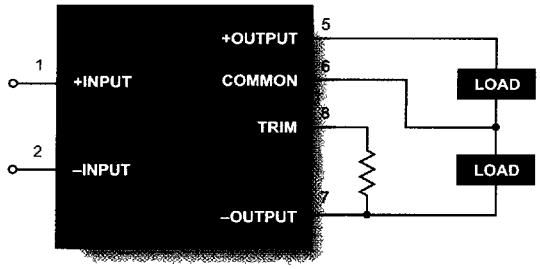


Figure 3c. Fixed-Value Trim Up Resistor

Input Fusing

Certain applications and/or safety agencies may require the installation of fuses at the inputs of power conversion components. For DATEL BHR 17-20 Watt DC/DC Converters, you should use slow-blow type fuses with values no greater than the following:

V_{IN} Range	Fuse Value
"D12"	4A
"D48"	2A

On/Off Control

The On/Off Control pin (pin 4) may be used for remote on/off operation. A TTL logic high (+2 to +5 Volts, 250µA max.) applied to pin 4 disables the converter. A TTL logic low (0 to +0.8 Volts, 70µA max.), or no connection, enables the converter. Control voltages should be referenced to pin 2 (–Input). Applying a voltage to the Control pin when no input power is applied to the converter can cause permanent damage to the converter.

Synchronization

In certain applications employing multiple BHR converters and also demanding minimal noise levels, some improvements may be had by synchronizing the switching of the various converters. The synchronizing clock should be applied to pin 4 (Control) of each device. It should be a square wave with a maximum 1µsec "high" duration and an amplitude between +2V and +5V (see On/Off Control) referenced to pin 2 (–Input). The frequency of the synchronizing clock should be higher than that of any individual converter. Therefore, it should be 180kHz ±5kHz.

Output Trimming

The total output voltage span, from +Output (pin 5) to –Output (pin 7) may be trimmed ±5% via a single external trimpot or fixed resistor. The trimpot should be connected as shown in Figure 3a with its wiper connected to pin 8 (Trim). A trimpot can be used to determine the value of a single fixed resistor which should be connected as shown in Figures 3b and 3c. Connect the resistor between pin 8 (Trim) and pin 5 (+Output) to trim "down" the output voltages. Connect the resistor between pins 8 and 7 (–Output) to trim "up" the output voltages. Fixed resistors should be metal-film types with absolute TCR's less than 100ppm/°C to ensure stability.

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