INNOVATION and EXCELLENCE

Dual Output
BER Models

Low-Cost, Wide-Input-Range 15 Watt, DC/DC Converters

Features

- **Low cost**
- **Rugged, fully potted, diallyl phthalate plastic packages**
- **Industry-standard form factor (2" x 2") and pinout**
- **No external components required**
- **±5, ±12 or ±15 Volt outputs**
- **Wide input voltage ranges: 9-36V or 18-72V**
- **Fully regulated (±0.5% line, ±1% load)**
- **Guaranteed efficiencies to 81%**
- **Fully isolated (750Vdc minimum) and I/O protected**
- **V_{OUT} trim and on/off control**
- **UL, CSA, IEC safety approvals**
- **Modifications and customs for OEM's**

DATEL's BER Model dual-output switching DC/DC converters were designed for cost-sensitive, moderate-power (15 Watts) applications requiring a reliable, off-the-shelf solution but not demanding all the high-performance characteristics of DATEL's A-Series BWR Model converters. Offering slightly wider electrical tolerances and slightly lower power densities (8.33W/in^3), BER devices achieve their low cost through the use of plastic packaging (UL94V-0 rated material) and the exploitation of traditional, yet highly automated, SMT-on-pcb construction techniques. The result is a contemporary power converter whose cost/performance/reliability ratio far exceeds the competition.

BER Model DC/DC converters all offer the ultra-wide, 9-to-36V and 18-to-72V, input voltage ranges that have come to be associated with DATEL power converters. Output voltages are ±5V, ±12V or ±15V. Line and load regulation are guaranteed not to exceed ±0.5% and ±1%, respectively. All models incorporate internal input/output filtering and require no external components for normal operation. All units guarantee output ripple/noise less than 100mVp-p.

These fully isolated (1000Vdc typical) devices are input overvoltage and reverse-polarity protected and employ output current limiting to protect both the power converter and its load. They function well in harsh environments and are popular for both commercial and industrial usage in computer, telecom, aerospace and industrial-control applications.

The industry-standard, 2" x 2" package size and pinout of the BER Models makes them ideal replacements for other, more costly, less reliable power converters. They are equally well suited for original design-ins in systems demanding both low cost and high reliability.

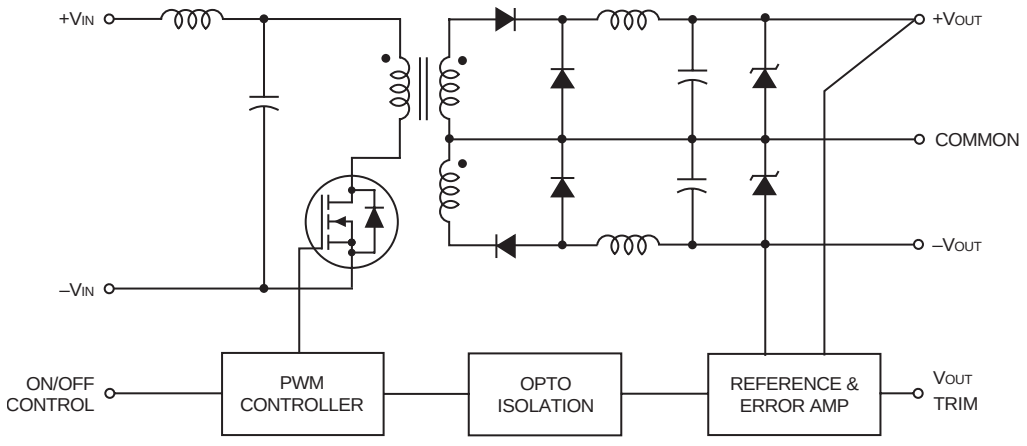


Figure 1. Simplified Schematic

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.)		V_{IN} Nom. (Volts)	Range (Volts)	I_{IN} ④ (mA, Max.)		
				Line	Load ③					
BER-5/1500-D12	±5	±1500	100	±0.5%	±1.0%	24	9-36	45/789	80%	C4, P7
BER-5/1500-D48	±5	±1500	100	±0.5%	±1.0%	48	18-72	25/395	80%	C4, P7
BER-12/625-D12	±12	±625	100	±0.5%	±1.0%	24	9-36	45/779	81%	C4, P7
BER-12/625-D48	±12	±625	100	±0.5%	±1.0%	48	18-72	25/390	81%	C4, P7
BER-15/500-D12	±15	±500	100	±0.5%	±1.0%	24	9-36	45/779	81%	C4, P7
BER-15/500-D48	±15	±500	100	±0.5%	±1.0%	48	18-72	25/390	81%	C4, P7

① Typical at T_A = +25°C under nominal line voltage and full-load conditions unless otherwise noted.
② Ripple/Noise (R/N) measured over a 20MHz bandwidth.
③ Balanced loads, 20% to 100% load.
④ Nominal line voltage, no-load/full-load conditions.

PART NUMBER STRUCTURE

B ER - 15 / 500 - D48

Output Configuration:
B = Bipolar

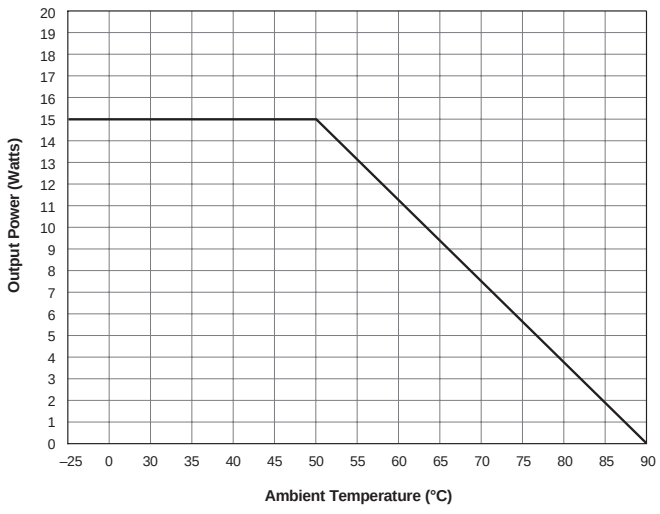
Low-Cost, Economy Package
Wide Range Input

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

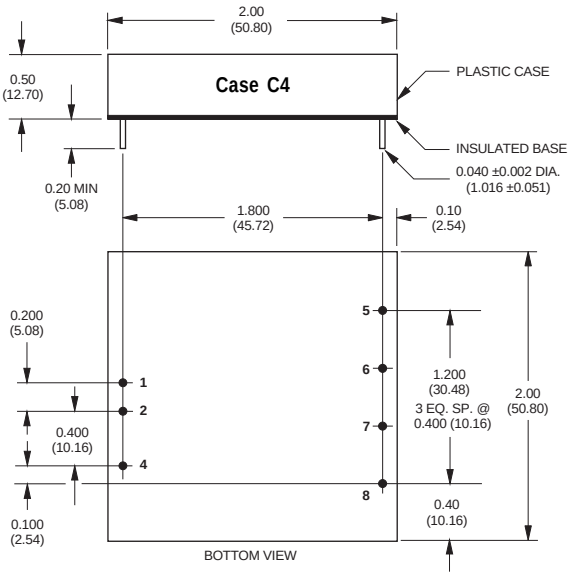
Maximum Output Current
in mA from each output

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

TEMPERATURE DERATING



MECHANICAL SPECIFICATIONS



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

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	LC
Overvoltage Shutdown:	
"D12 Models"	40 Volts
"D48 Models"	80 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)	±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 ④	750Vdc, minimum
Isolation Capacitance	550pF
Current Limiting	Continuous, auto-recovery
Overvoltage Protection	Zener/transorb clamps, magnetic feedback
Dynamic Characteristics	
Transient Response (50% load step)	200µsec max. to ±1.5% of final value
Switching Frequency	160kHz
Environmental	
Operating Temperature (ambient): ⑤	
Without Derating	–25 to +50°C
With Derating	to +90°C (See Derating Curve)
Storage Temperature	–40 to +100°C
Physical	
Dimensions	2" x 2" x 0.5" (51 x 51 x 12.7mm)
Shielding	None
Case Connection	None
Case Material	Diallyl phthalate, UL94V-0 rated
Pin Material	Brass, solder coated
Weight	2.7 ounces (75.6 grams)

① These power converters require a minimum 20% 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 recommended or perhaps added internally upon request. Contact DATEL Applications Engineering for details.

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

④ Devices can be screened or modified for higher guaranteed isolation voltages. Contact DATEL Applications Engineering for details.

⑤ Devices can be screened for –40°C operation. Contact DATEL Applications Engineering for details.

Absolute Maximum Ratings	
Input Voltage:	
"D12" Models	44 Volts
"D48" Models	88 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. currents are model dependent. Units can withstand a continuous output
short	on any output for 3 minutes.
Storage Temperature	–40 to +105°C
Lead Temperature (soldering, 10 sec.)	+300°C

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.

TECHNICAL NOTES

Floating Outputs

Since these are isolated DC/DC converters, their outputs are "floating." Any BER 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 BER 15 Watt DC/DC Converters achieve their rated ripple and noise specifications without the use of external input/output capacitors. In critical applications, input/output 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 many 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 Output	47µF, 10V, Low ESR
±12/15V Outputs	22µF, 20V, Low ESR

In critical, space-sensitive applications, DATEL may be able to tailor the internal input/output filtering of these units to meet your specific requirements. Contact our Applications Engineering Group for additional details.

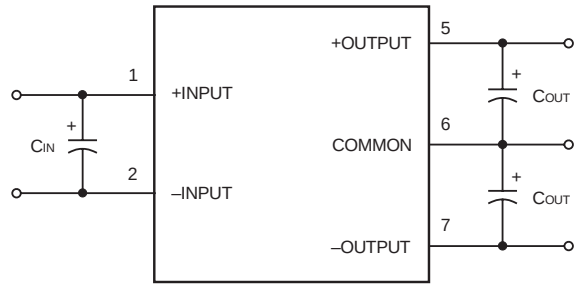


Figure 2. Using External Capacitors to Reduce Input/Output Ripple/Noise

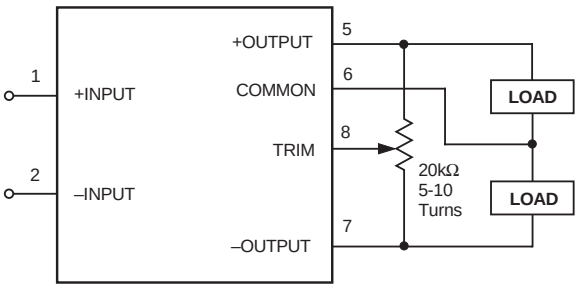


Figure 3a. Trim Connections Using a Trimpot

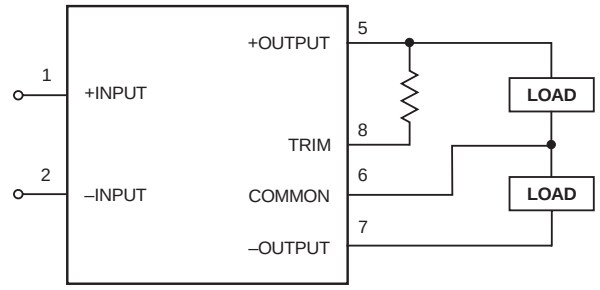


Figure 3b. Fixed-Value Trim Down Resistor

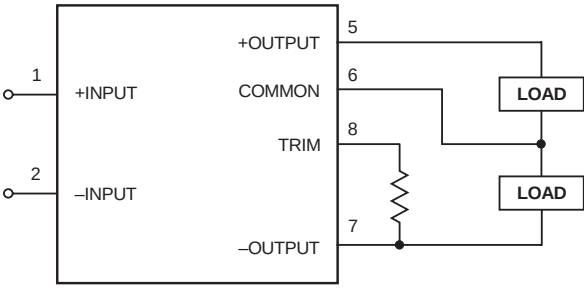


Figure 3c. Fixed-Value Trim Up Resistor

Input Fusing

Certain applications and/or safety agencies may require the installation of fuses at the inputs of power conversion components. For DATEL BER 15 Watt DC/DC Converters, you should use slow-blow type fuses with values no greater than the following:

V_{IN} Range	Fuse Value
"D12"	3A
"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 critical applications employing multiple switching DC/DC converters, it may be desirable to intentionally synchronize the switching of selected converters (so the system noise can be reduced with notch filtering) or to purposely desynchronize the converters (to lessen the current-carrying requirements on intermediate dc buses). For multiple BER DC/DC Converters, an external clock can 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 185kHz ±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.

DATEL® INNOVATION and EXCELLENCE

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