



BD150009
150W SINGLE DC/DC CONVERTER
 $18\text{--}36V_{IN}$ $48V_{OUT}@3A$

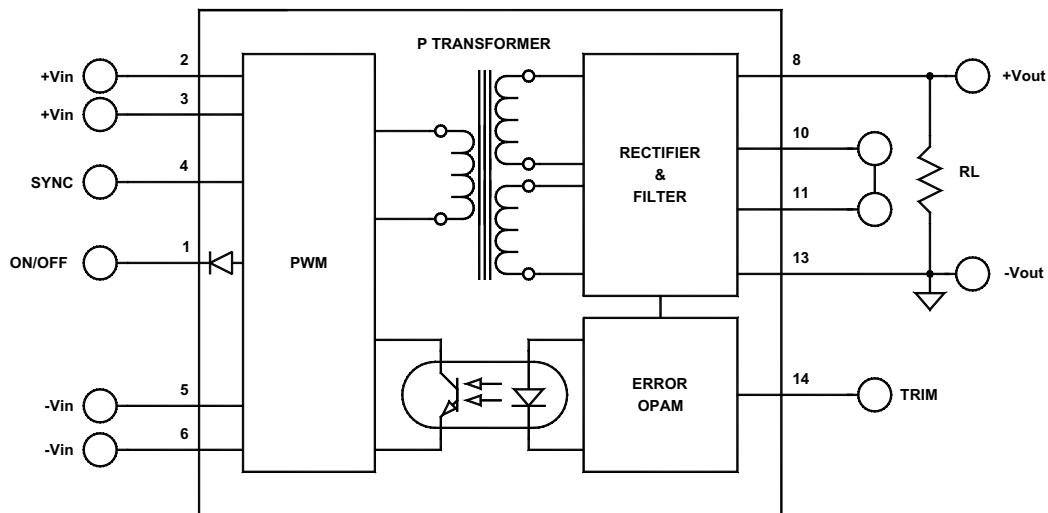
Key Features

- Efficiency up to 90%
- 1500Vdc input-to-output isolation
- 2:1 input voltage range
- Input undervoltage protection
- Output overvoltage protection
- Soft start
- Adjustable output
- 160kHz switching frequency
- Thermal protection
- Six-sided shielding



Functional Description

The BD150009 is a 150W single-output, isolated DC/DC converter that accepts $18\text{--}36V_{IN}$ and delivers $48V_{OUT}@3A$ to the load. The converter can be synchronized to an external square wave 5V CMOS clock with a frequency range of 360 to 380kHz AC-coupled through a 100pF capacitor to Pin 4. Its high switching frequency, SMD design, and thermal management improves efficiency and reliability. The converter is designed and thoroughly tested for an input-to-output isolation of 1500Vdc.



Typical Block Diagram

Electrical Specifications

INPUT SPECIFICATIONS

Unless otherwise specified, all parameters are given under typical +25°C with nominal input voltage and under full output load conditions.

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Input Voltage Range		18	24	36	Vdc
Input Startup Voltage		15			Vdc
Input Filter	C				
Reverse Polarity	External series-blocking diode				
Reflected Ripple			60		mA _{PP}
No Load Input Current			25		mA
Full Load Input Current			7963		mA
Input Surge Current (20µS Spike)				10	A
Short Circuit Current Limit			150		% I _{IN}
Off State Current			1		mA
Remote ON/OFF Control					
Supply ON	Pin 1 Open (Open circuit voltage: 13V max.)				
Supply OFF		0		0.8	Vdc
Logic Input Reference	-Input for ON/OFF				
Logic Compatibility for Reference	TTL Open Collector or CMOS Open Drain				
Sync Input	TTL (AC Coupled)	2.5		5	Vdc
Sync Input Frequency Range		320	340	360	kHz

OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Output Voltage			48		Vdc
Output Voltage Accuracy			±1	±2	%
Output Current		30			A
Ripple & Noise		1	2		%V _{PP} of V _{OUT}
Line Regulation			±0.5	±1	%
Load Regulation			±1	±2	%
Output Overvoltage Protection		120			% of V _{OUT}
Temperature Coefficient @ FL		0.02			%/°C
Transient Response Time (to within 1% of V)	50% FL to FL to 50% FL, See Figure 7	250			µS
Short Circuit Protection	By input current limiting				
Output Adjust Range	See Figures 1–4,		±5		%

GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency		90			%
Isolation Voltage (1 min.), Input to Output	100% Tested in production		1500		Vdc
Isolation Resistance			10 ⁹		Ω
Isolation Capacitance			180		pF
Switching Frequency			185		kHz
Turn On Delay	See Figure 7	7	10		µS
Soft Start Time	See Figure 7	7	15		µS

ENVIRONMENTAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature Range (Ambient)*	See Figure 5	-40		+70	°C
Storage Temperature Range		-55		+125	°C
Thermal Resistance	°C per watt internally dissipated		2.5	3	°C/W _{DISS}
Maximum Operating Case Temperature				110	°C
Derating	See Figure 5				
Cooling	Free air convection				
EMI/RFI	Six-sided continuous shielded metal case				
MTBF	per MIL-HNBK-217F (Ground benign, +25°C)		400,000		hours
Humidity	Up to 95% non-condensing				
Thermal Shutdown	Case Temperature		110	115	°C
Thermal Hysteresis			25	35	°C

* See footnotes 1 and 2.

PHYSICAL CHARACTERISTICS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Dimensions (L×W×H)	3.00×2.56×0.75 in. (76.20×65.02×19.05mm)				
Weight	7.87 oz. (223g)				
Case Material	Black coated copper				
Shielding Connection	-V _{IN} (Pins 5 & 6)				

¹ Adequate insulation is to be provided to the converters at the end usage as per applicable requirements.

² Temperature rise on the case of the converters is to be considered during the end usage as per applicable requirements.

³ The maximum input current at any given input range measured at minimum input voltage is given as $1.6 \cdot I_{NOMINAL}$. Nominal input current is the typical value measured at the input of the converter under full-load room temperature and nominal input voltage (24Vdc).

⁴ Measured with 100µF capacitor at the input power pins.

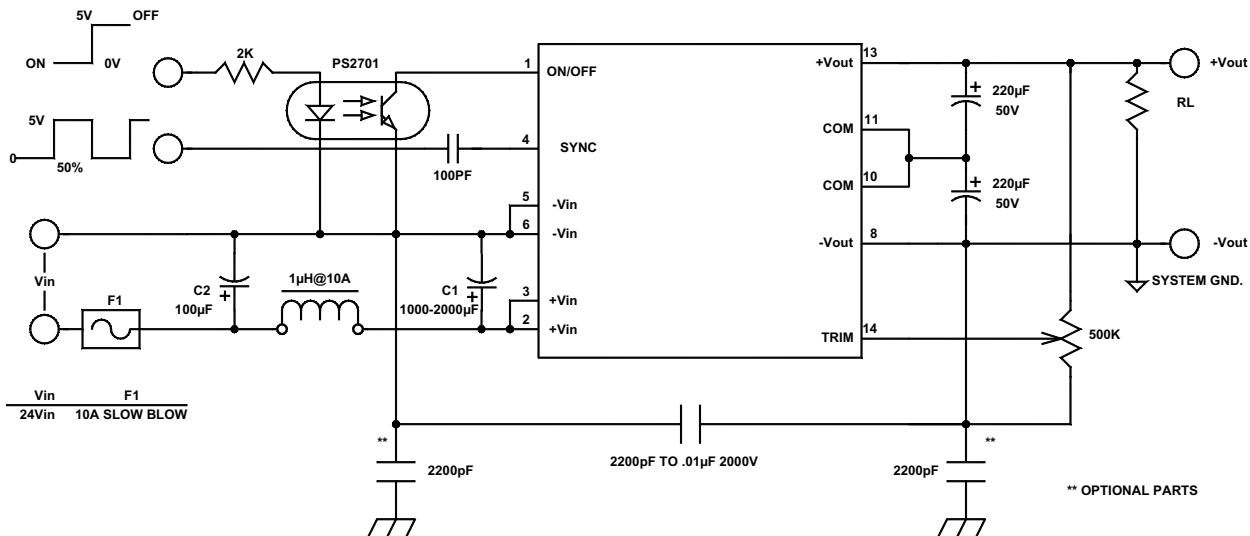


FIGURE 1. Typical connection diagram of dual output converter

NOTE: Do not connect output COM pins (Pins 10 & 11) to system ground. The COM pins can be used for output noise filtering as shown above.

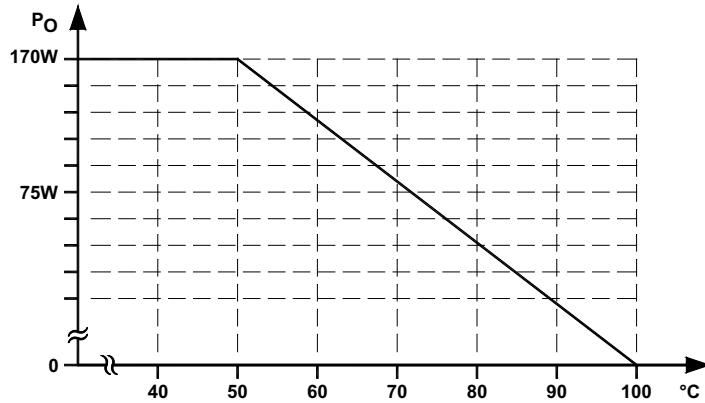


FIGURE 2. Typical derating curve with free air cooling

EXTERNAL TRIMMING OF OUTPUT VOLTAGES

To trim the output voltage DOWN, connect a 5% 1/4W resistor between the $+V_{O1}$ output and trim pin of the converter. To trim the output voltage UP, connect a 5% 1/4W resistor between the $-V_{O1}$ output and trim pins of the converter. For UP/DOWN trimming capability, connect a 500k Ω potentiometer between the + and - output pins, with the wiper arm connected to the trim pin.

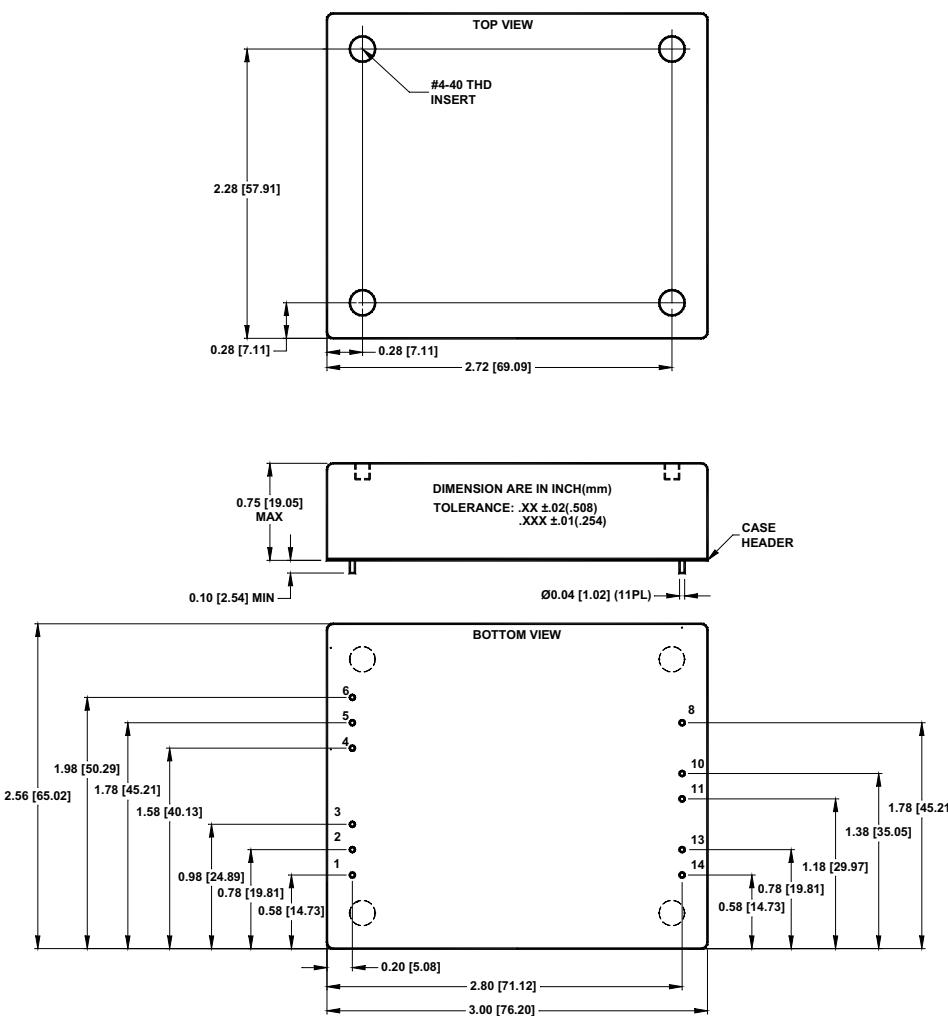
The trim resistors/potentiometer can be connected at the converter output pins or the load. However, if connected at the load,

the resistance of the runs becomes part of the feedback network which improves load regulation. If the load is some distance from the converter, the use of #20 gauge wire is recommended to avoid excessive voltage drop due to the resistance of the circuit paths.

See our application notes:

- DC-001: Testing Transient Response in DC/DC Converters
- DC-004: Thermal Consideration for DC/DC Converters

MECHANICAL SPECIFICATIONS



Pin	Function
1	ON/OFF
2	$+V_{IN}$
3	$+V_{IN}$
4	SYNC
5	$-V_{IN}$
6	$-V_{IN}$
8	$-V_{OUT}$
10	COM*
11	COM*
13	$+V_{OUT}$
14	V_{OUT} ADJ

* Do not connect COM pins to output ground.

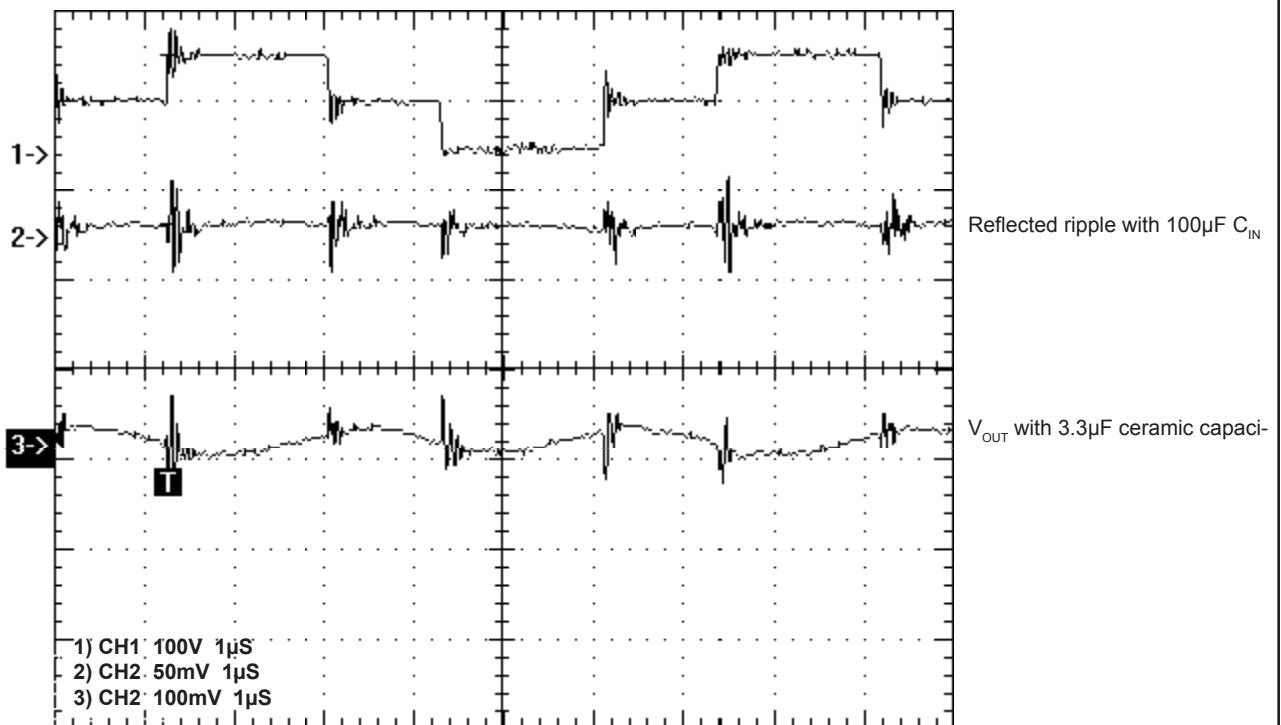


FIGURE 3. Reflected ripple and V_{OUT}

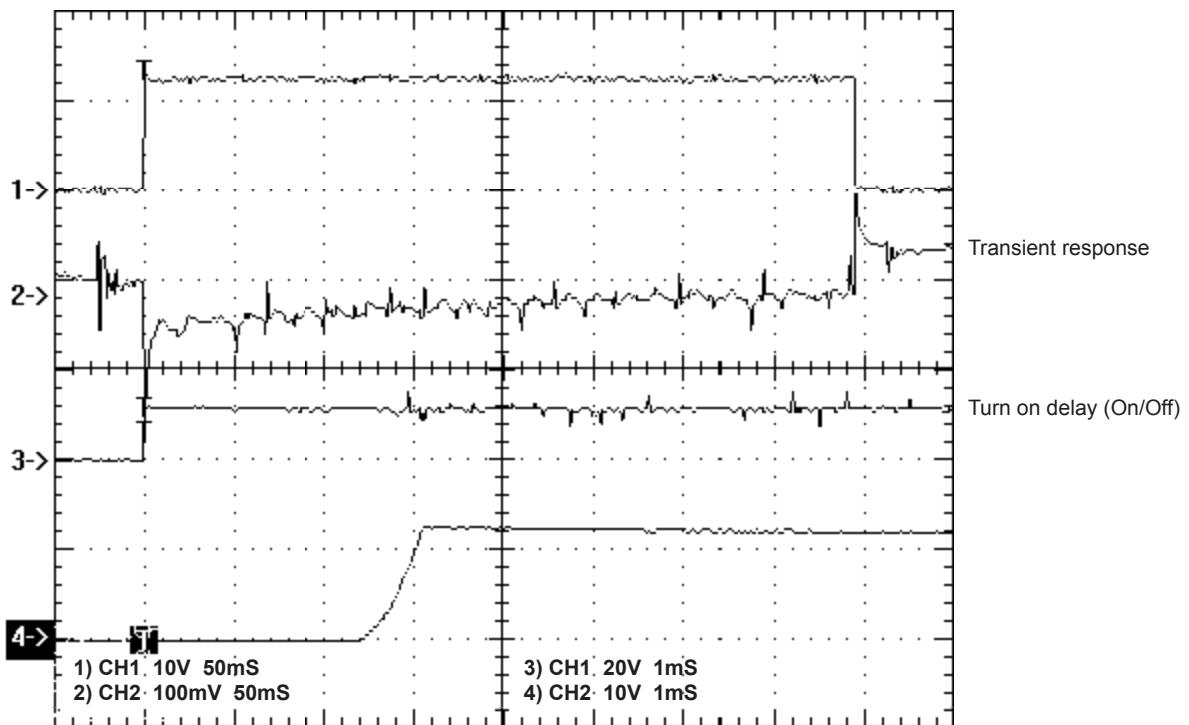


FIGURE 4. Transient response and turn on delay with soft start

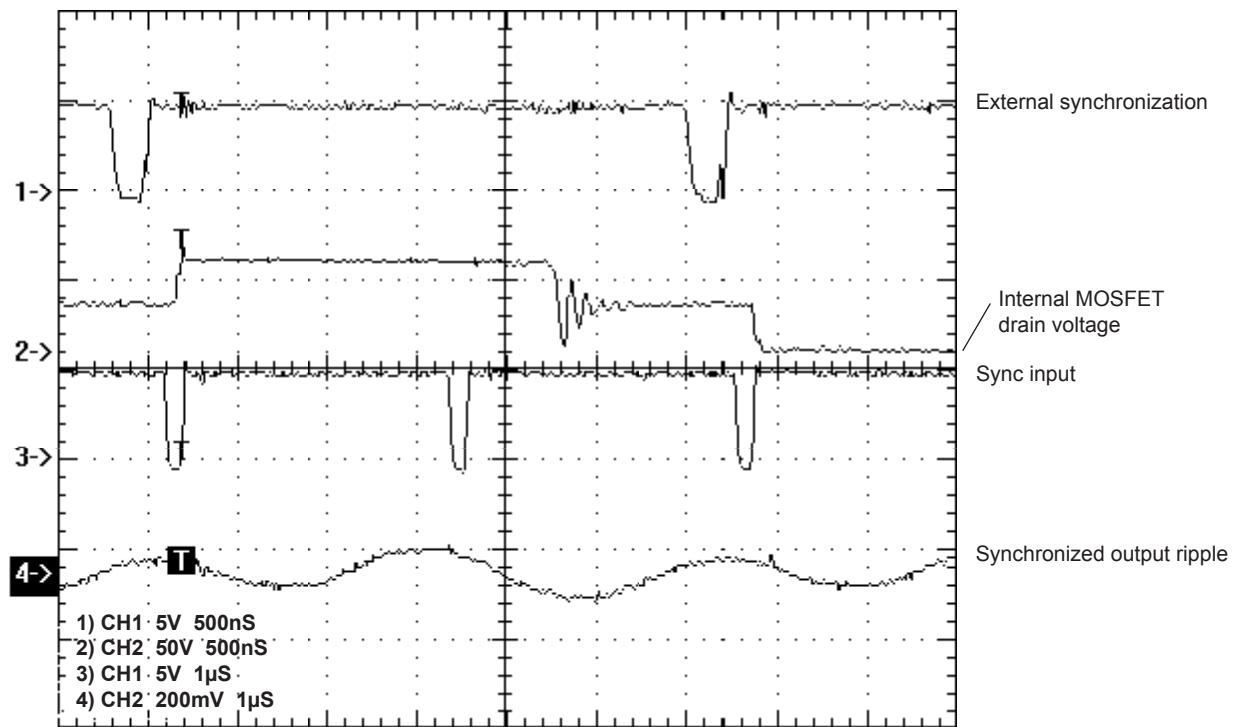


FIGURE 5. Synchronization waveforms

SYNCHRONIZATION

To synchronize the internal PWM frequency to an external clock, AC couple the external TTL or CMOS signal to pin 4 (SYNC) through a 200 to 470 pF capacitor.

The frequency of the external clock must be equal or greater than the PWM frequency which is 2x the switching frequency of the converter. (This is valid for all push pull converters.)

The duration of the external clock pulse must be 2150 ns minimum up to 50% duty cycle.

For more information, see application note:
DC-005: Synchronization