PRELIMINARY

BD35042

DC/DC Converter

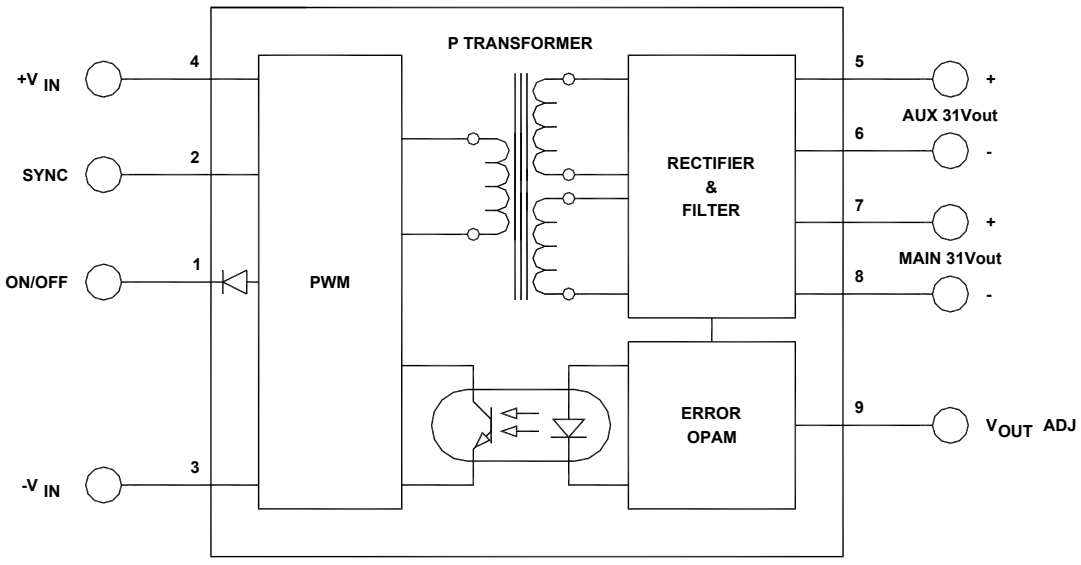
40 to 57V_{IN}, Dual +/- 31V_{OUT} Isolated

Key Features

- 83% efficiency
- 40V to 57V input voltage range
- Input under/overvoltage protection
- Input-to-output isolation
- Soft start
- Dual short circuit protection
- 500µA off state current
- Multiple converter synchronization
- Adjustable outputs
- 330kHz switching frequency
- Thermal protection
- Six-sided shielding

Functional Description

The BD35042 is an isolated dual output DC/DC converter that accepts 40V_{IN} to 57V_{IN} and provides two isolated output voltages with the main output V_{O1} set for 31V_{OUT}@.56A and the auxiliary output V_{O2} set for 31V_{OUT}@.56A. The main output provides ±1% line and load regulation, and the auxiliary output provides ±5% line and load regulation through magnetic coupling. The auxiliary output tracks the main output when V_{OUT} adjust is used. The V_{O1}adjust range is 29V to 34V.



Typical Block Diagram

Electrical Specifications

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

INPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Input Voltage Range		40	48	57	Vdc
Input Startup Voltage,		36			Vdc
Input Overvoltage Protection,		59			Vdc
Input Filter	LC				
Reverse Polarity	External series-blocking diode				
Reflected Ripple			100		mA_{PP}
No Load Input Current			12		mA
Full Load Input Current			877		mA
Input Surge Current (20µS Spike)				10	A
Short Circuit Current Limit	See Short Circuit Protection		150		% I_{IN}
Off State Current			500		µA
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 and SYNC				
Logic Compatibility for Reference	TTL Open Collector or CMOS Open Drain				

OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Output Voltage, V_{o1}		29	31	34	Vdc
Output Voltage, V_{o2}			31		Vdc
Output Voltage Accuracy, V_{o1}			±1	±2	%
Output Voltage Accuracy, V_{o2}	Minimum load of 10% required		±5	±7.5	%
Output Current, V_{o1}			.56	.65	A
Output Current, V_{o2}			.56	.65	A
Ripple & Noise, V_{o1}			±1.0	±1.5	$\%V_{PP}$ of V_{OUT}
Ripple & Noise, V_{o2}			±1.5	±2.3	$\%V_{PP}$ of V_{OUT}
Line Regulation, V_{o1}			±0.5	±1	%
Line Regulation, V_{o2}			±3	±5	%
Load Regulation, V_{o1}			±1	±2	%
Load Regulation, V_{o2}	10% FL to FL		±3	±5	%
Temperature Coefficient @ FL			0.02		%/°C
Transient Response Time	50% FL to FL to 50% FL		200	250	µS
Short Circuit Protection	By input current limiting				
Output Adjust Range			±10		%

GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency			83		%
Isolation Voltage (1 min.), Input to Output			1500		Vdc
Isolation Voltage (1 min.), Output to Output			500		Vdc
Isolation Resistance			10^9		Ω
Isolation Capacitance			2700		pF
Switching Frequency			330		kHz
Turn On Delay	See Figure 6		7	10	mS
Soft Start Time	See Figure 6		7	15	mS

ENVIRONMENTAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature Range (Ambient)*		-40		+71	°C
Storage Temperature Range		-55		+125	°C
Thermal Resistance	°C per watt internally dissipated		7		°C/W_{DISS}
Maximum Operating Case Temperature				110	°C
Cooling	Free-air convection				
EMI/RFI	Six-sided continuous shielded metal case				
MTBF	per MIL-HNBK-217F (Ground benign, +25°C)		1.1×10^6		hours
Humidity	Up to 95% non-condensing				
Thermal Shutdown	Case Temperature		110	115	°C
Thermal Hysterisis		2	5		°C

* See footnotes 3, 4, and 5

PHYSICAL CHARACTERISTICS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Dimensions (L×W×H)	2.00×2.00×0.50 in. (50.80×50.80×12.70mm)				
Weight	2.43 oz. (69g)				
Case Material	Coated metal				
Shielding Connection, $48V_{IN}$	$+V_{IN}$ (Pin 4)				

[1] WARNING - Usage of input fuse with adequate ratings is essential to avoid possible hazard and damage of the unit. A suppressor diode with adequate ratings is intended to be connected in series to the supply for reverse polarity protection.
[2] Measured with 10µF capacitor at the input power pins.
[3] Contact factory for -55° to +85°C operating temperature range.
[4] Adequate insulation is to be provided to the converters at the end usage as per applicable requirements.
[5] Temperature rise on the case of the converters is to be considered during the end usage as per applicable requirements.

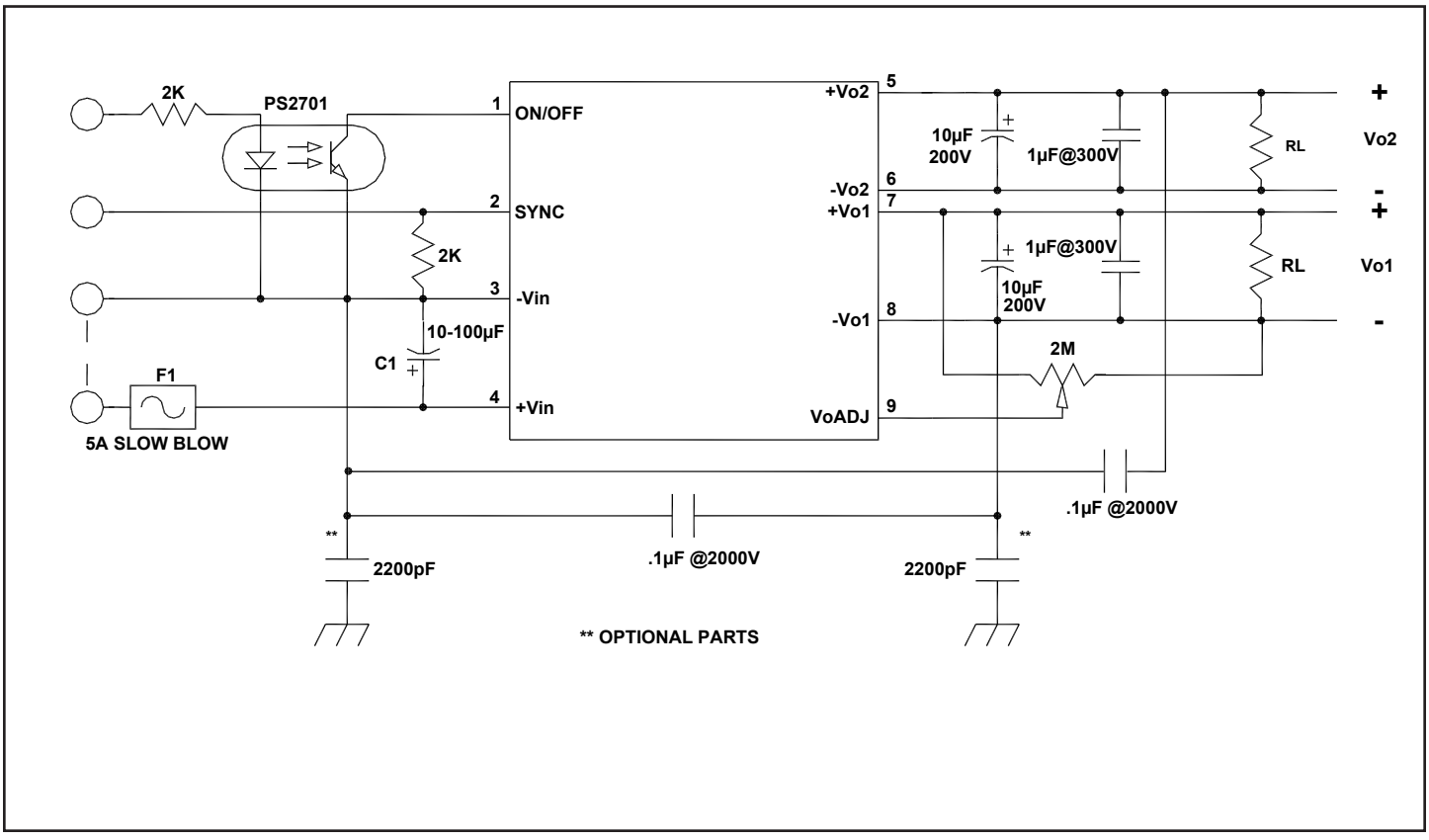


FIGURE 1. Typical BD35042 connection diagram

EXTERNAL TRIMMING OF OUTPUT VOLTAGES (SINGLE AND DUAL ONLY)

To trim the output voltage DOWN, connect a 5% ¼W 1.5MΩ resistor (DO NOT GO BELOW 1MΩ) between the $+V_{O1}$ (Pin 7) output and trim pin of the converter. To trim the output voltage UP, connect a 5% ¼W resistor between the $-V_{O1}$ (Pin 8) output and trim pins of the converter. For UP/DOWN trimming capability, connect a 2MΩ 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

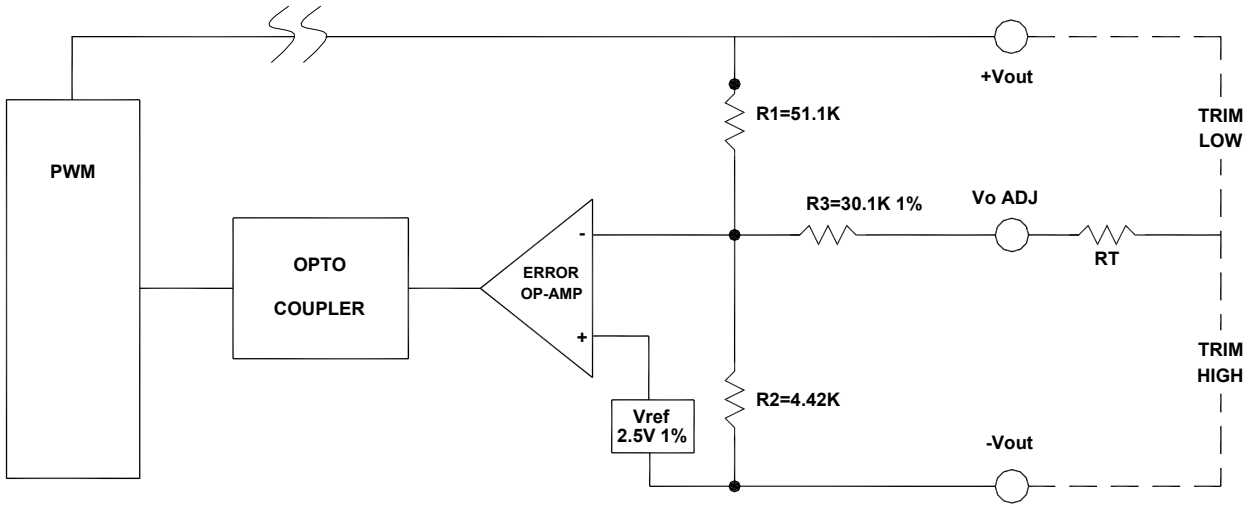


FIGURE 3. Output control circuit of BD35042 DC/DC converter

$$V_o = V_{REF}*(1 + (R_1 /R_3)+ (R_1 /R_2)) - (R_1 /R_3)*V_{OADJ}$$

$$V_o = 35.648- 1.698V_{OADJ}$$

To trim V_O higher to V_O', where V_O is the actual measured value:

$$RT = \frac{R1*V_{REF}}{V_O' - V_O} - 30.1K$$

To trim V_O lower to V_O'', where V_O is the actual measured value:

$$RT = \left[\left(\frac{R_1^2*V_{REF}}{R_2(V_O - V_O'')} - R1 \right) - 30.1K \right]$$

EXTERNAL SYNCHRONIZATION

The converter can be synchronized to an external clock. The external clock MUST have a higher frequency than that of the converter's switching frequency. The amplitude of the external clock pulse must be 3.7 volts or greater and its duration between 15nS to 150nS for sync pulse detection.

The circuit in Figure 4 can be used to produce a 50nS to 150nS pulse from a square wave. The circuit will be turned on by the negative edge of the square wave and will stay on for approximately 50nS (depending on the R2*C1 time constant) (See Figure 5).

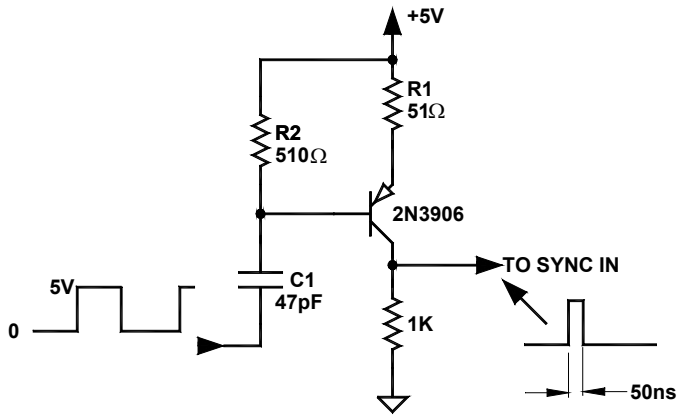


FIGURE 4. 50nS pulse generator from a square wave TTL/5V CMOS Clock

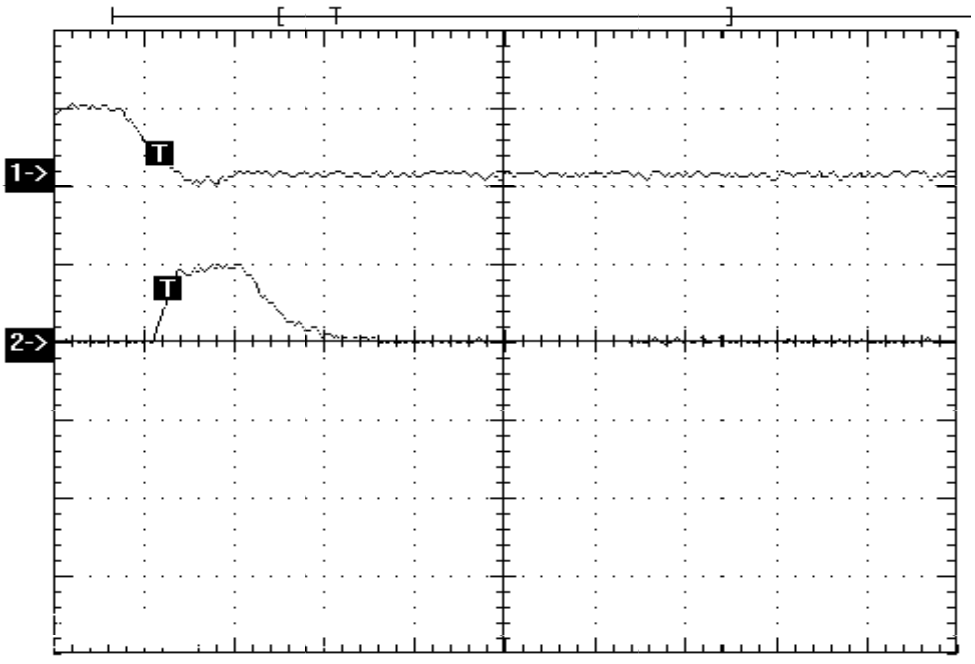
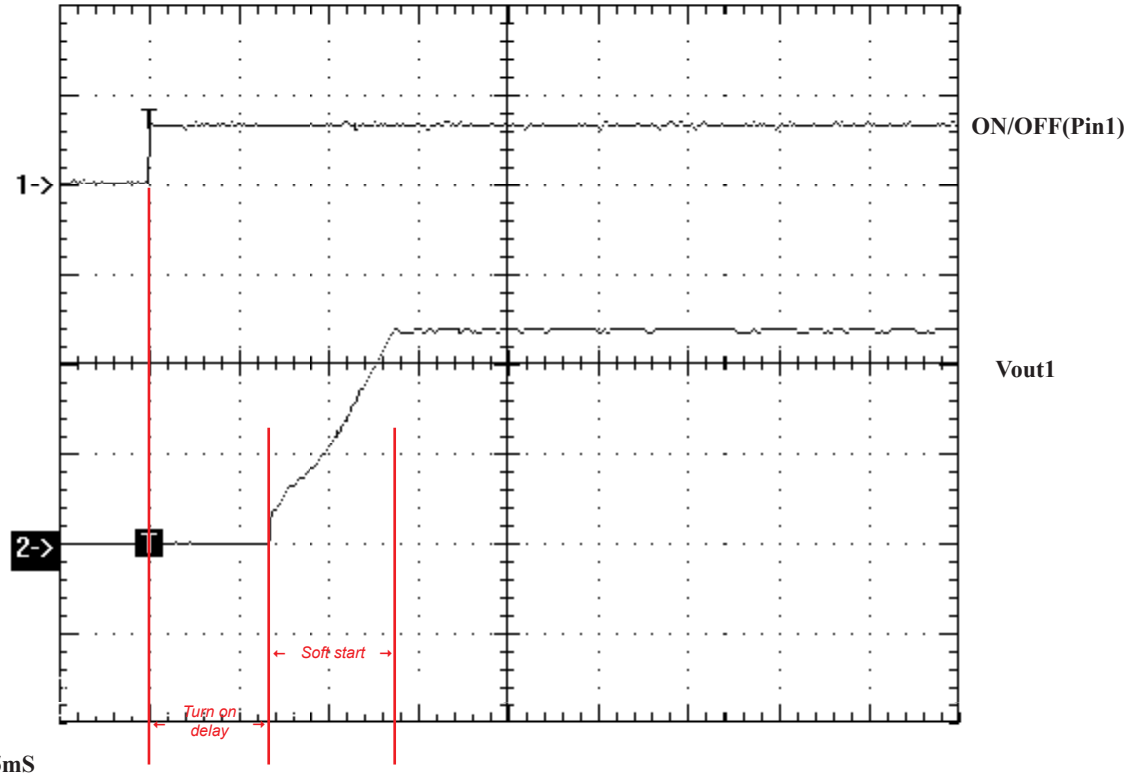


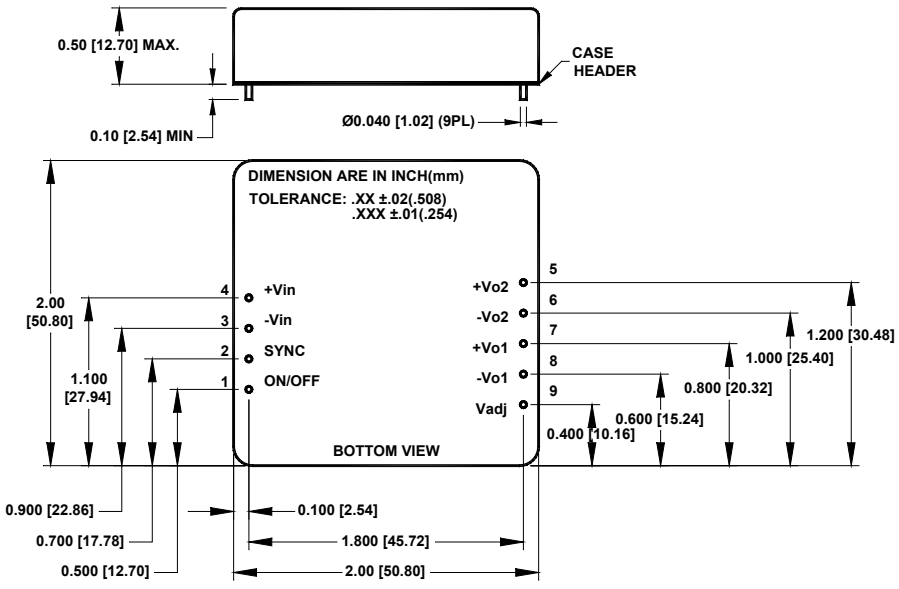
FIGURE 5. Waveforms generated from circuit in Figure 5



1) CH1 20V 5mS
2) CH2 20V 5mS

FIGURE 6. Turn on delay and soft start

MECHANICAL SPECIFICATIONS



Pin	Function
	DUAL
1	ON/OFF
2	SYNC
3	$-V_{IN}$
4	$+V_{IN}$
5	$+V_{O2}$
6	$-V_{O2}$
7	$+V_{O1}$
8	$-V_{O1}$
9	V_{OUT} ADJ