



BD100000

100W HIGH-VOLTAGE DC/DC CONVERTER

1000Vdc Isolation

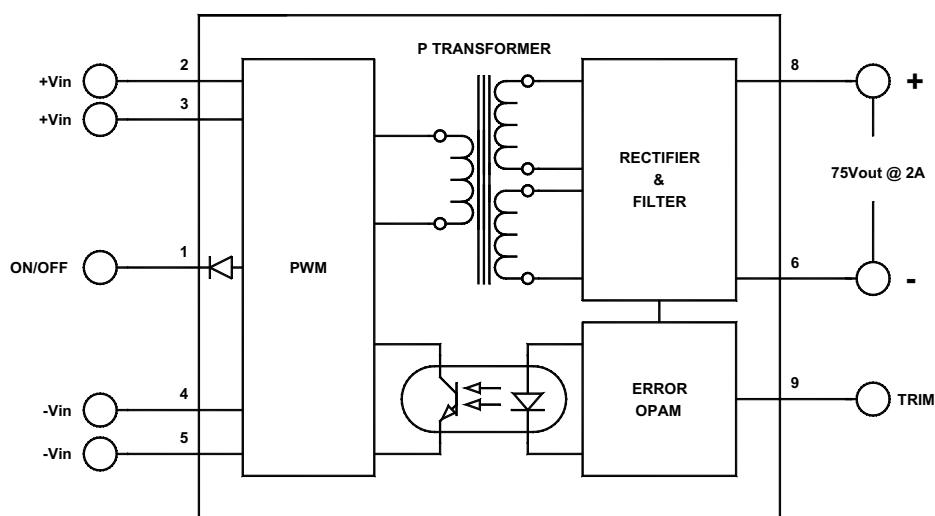
Key Features

- 93% efficiency
- 1000Vdc input-to-output isolation
- 2:1 input voltage range
- Input undervoltage protection
- Output undervoltage protection
- Soft start
- Adjustable output
- 300kHz switching frequency
- Thermal protection
- Six-sided shielding



Functional Description

The BD100000 high-voltage isolated DC/DC converter accepts 19Vdc to 40Vdc input and produces a regulated 12Vdc@8.3A at its output with an adjustable range of $\pm 5\%$. A high switching frequency of 300kHz, synchronous rectification, SMD, and thermal management improve efficiency and reliability. The converter is designed and thoroughly tested for an input-to-output isolation of 1000Vdc.



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		19	28	40	Vdc
Input Startup Voltage		15			Vdc
Input Filter	C				
Reverse Polarity	External series-blocking diode				
Reflected Ripple	$I_o = FL, C_{IN} = 100\mu F$, See Figure 3		100		mA_{PP}
No Load Input Current			40		mA
Full Load Input Current	Nominal line and Full load		6700		mA
Input Surge Current (20μS Spike)				10	A
Short Circuit Current Limit	Hiccup, See Figure 3		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				

OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Output Voltage			12		Vdc
Output Voltage Accuracy	See formulas for RT in Figure 1B		±1	±2	%
Output Current			8330		mA
Ripple & Noise			1	2	% V_{PP} of V_{OUT}
Line Regulation			±0.5	±1	%
Load Regulation			±1	±2	%
Output Overvoltage Protection			86		Vdc
Temperature Coefficient @ FL			0.02		%/°C
Transient Response Time (to within 1% of V)	50% FL to FL to 50% FL, See Figure 4		100		μS
Short Circuit Protection	By input current limiting				
Output Adjust Range	See Figure 1B,		±5		%

GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency			93		%
Isolation Voltage (1 min.), Input to Output	100% Tested in production	1000			Vdc
Isolation Resistance			10 ⁹		Ω
Isolation Capacitance			2700		pF
Switching Frequency			300		kHz
Turn On Delay	See Figure 5		7	10	mS
Soft Start Time	See Figure 5		7	15	mS

ENVIRONMENTAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature Range (Ambient)*	See Figure 2	-25		+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 2				
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

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, 24V _{IN}	-V _{IN} (Pins 4 & 5)				

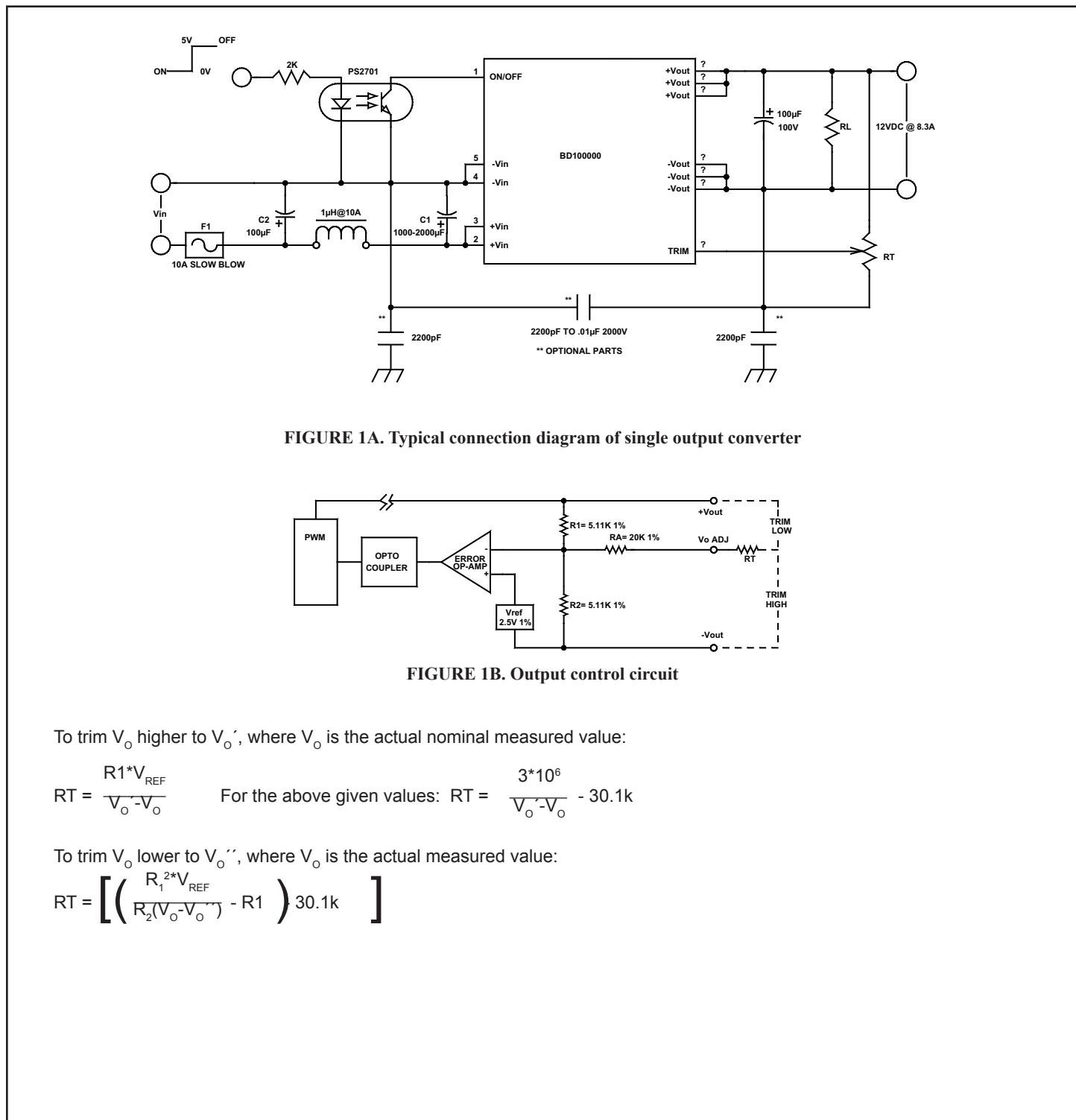
* See footnotes 3 and 4.

¹ Measured with 100μF capacitor at the input power pins.

² The maximum input current at any given input range measured at minimum input voltage is given as 1.6*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).

³ Adequate insulation is to be provided to the converters at the end usage as per applicable requirements.

⁴ Temperature rise on the case of the converters is to be considered during the end usage as per applicable requirements.



To trim V_O higher to V_{O'}, where V_O is the actual nominal measured value:

$$RT = \frac{R1 * V_{REF}}{V_O - V_O'} \quad \text{For the above given values: } RT = \frac{3 * 10^6}{V_O' - V_O} - 30.1k$$

To trim V_O lower to V_{O''}, where V_O is the actual measured value:

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

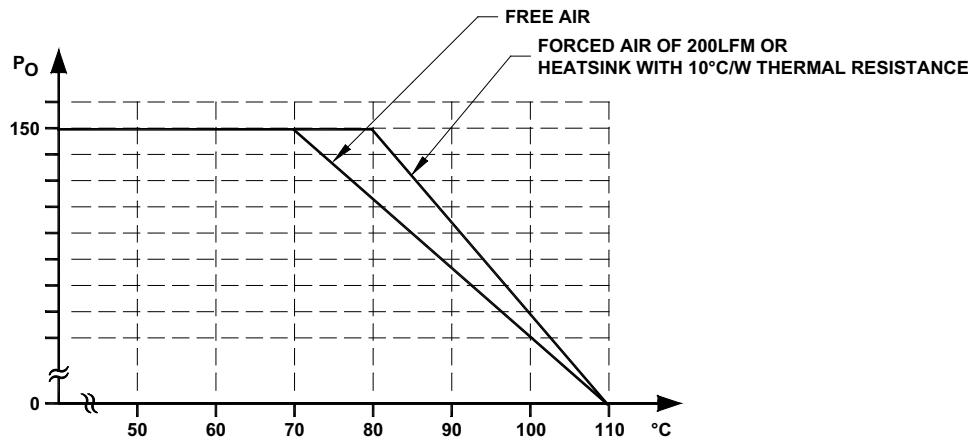


FIGURE 2. Typical derating curves

EXTERNAL TRIMMING OF OUTPUT VOLTAGES

To trim the output voltage DOWN, connect a 5% $\frac{1}{4}$ W 1.5M Ω resistor (DO NOT GO BELOW 1M Ω) between the +V_{O1} (Pin 8) output and trim pin of the converter. To trim the output voltage UP, connect a 5% $\frac{1}{4}$ W resistor between the -V_{O1} (Pin 6) output and trim pins of the converter. For UP/DOWN trimming capability, connect a 2M Ω potentiometer between the + and - output pins, with the wiper arm connected to the trim pin.

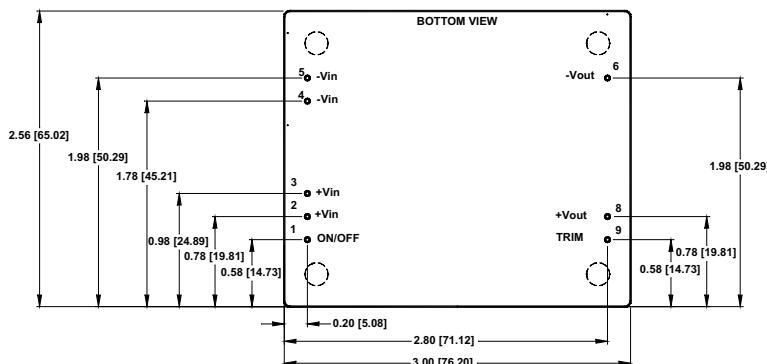
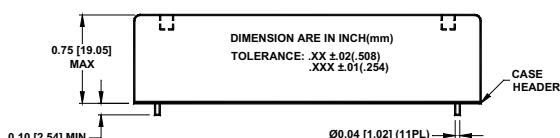
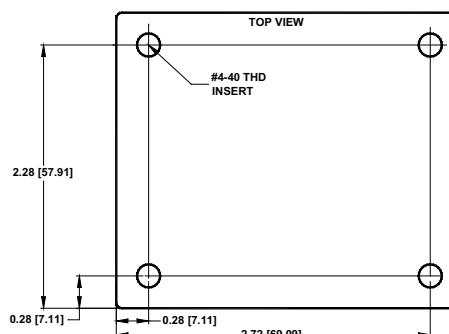
The trim resistors/potentiometer can be connected at the

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
SINGLE	
1	ON/OFF
2	+V _{IN}
3	+V _{IN}
4	-V _{IN}
5	-V _{IN}
6	-V _{OUT}
7	No Pin
8	+V _{OUT}
9	V _{OUT} ADJ

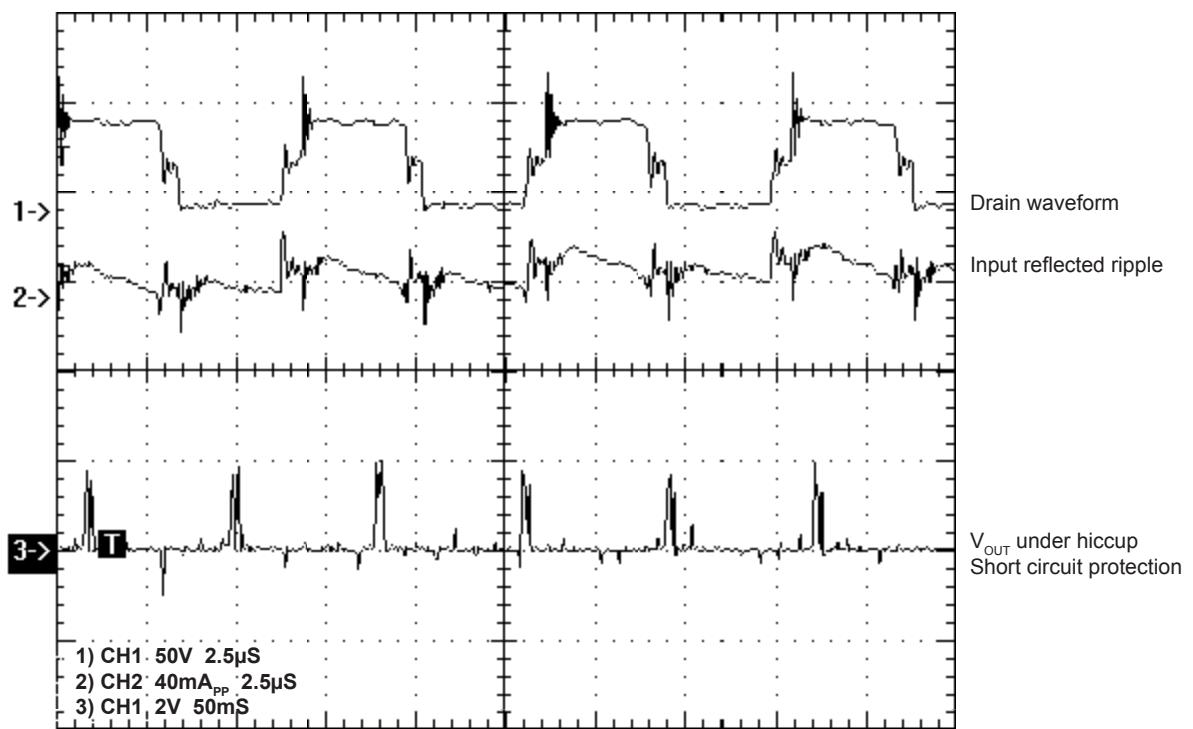


FIGURE 3. Reflected ripple and V_{OUT} under hiccup

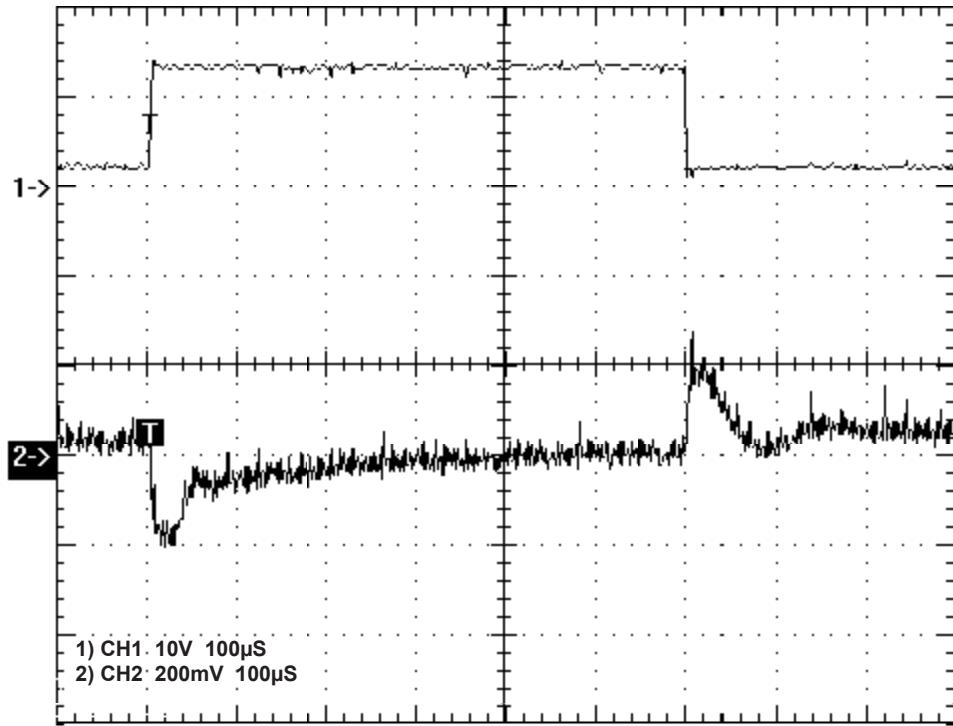


FIGURE 4. Transient response 60% FL to FL to 60% FL
with $C_{IN}=1000\mu F$ 35V, $C_o=10\mu F$ 100V ceramic

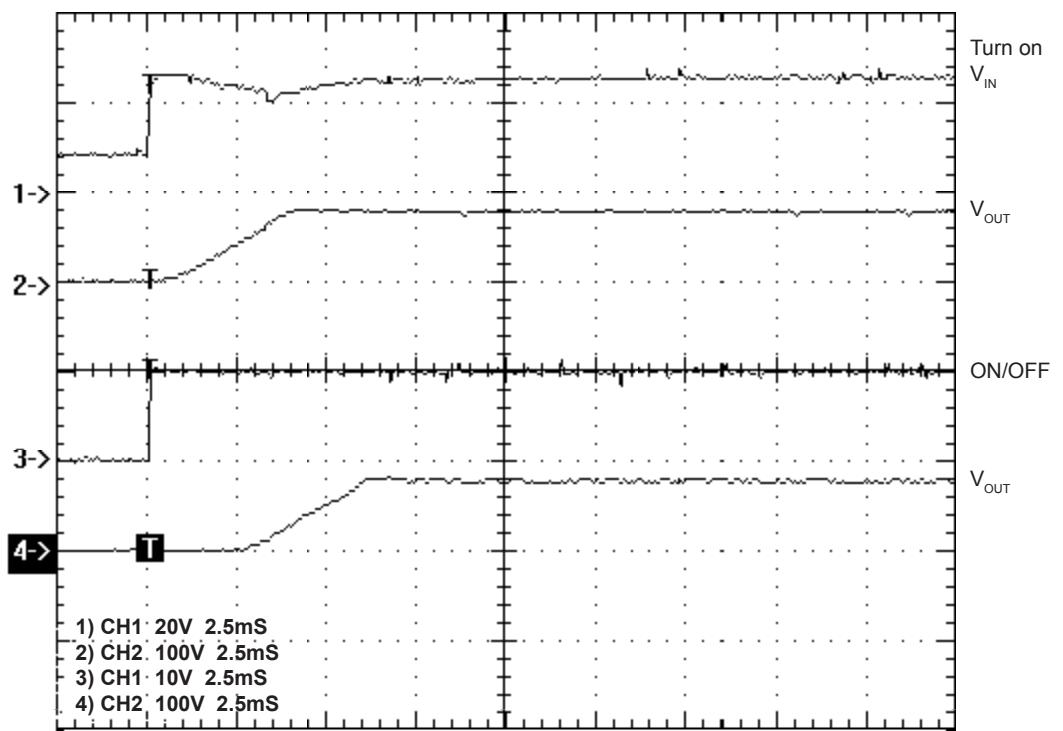


FIGURE 5. Turn on delay with soft start