

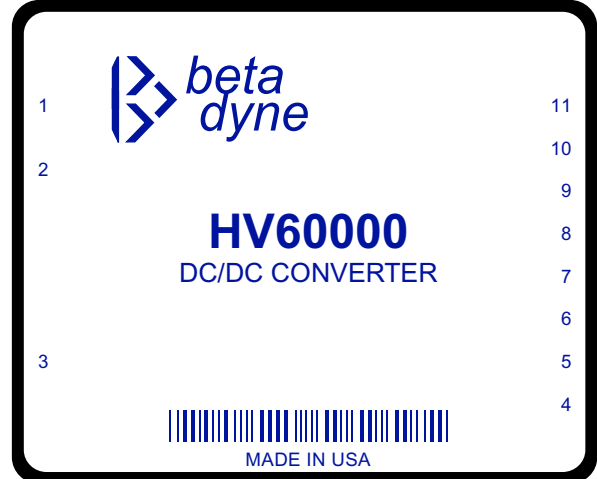


# HV60000

## 60W HIGH-VOLTAGE DC/DC CONVERTER

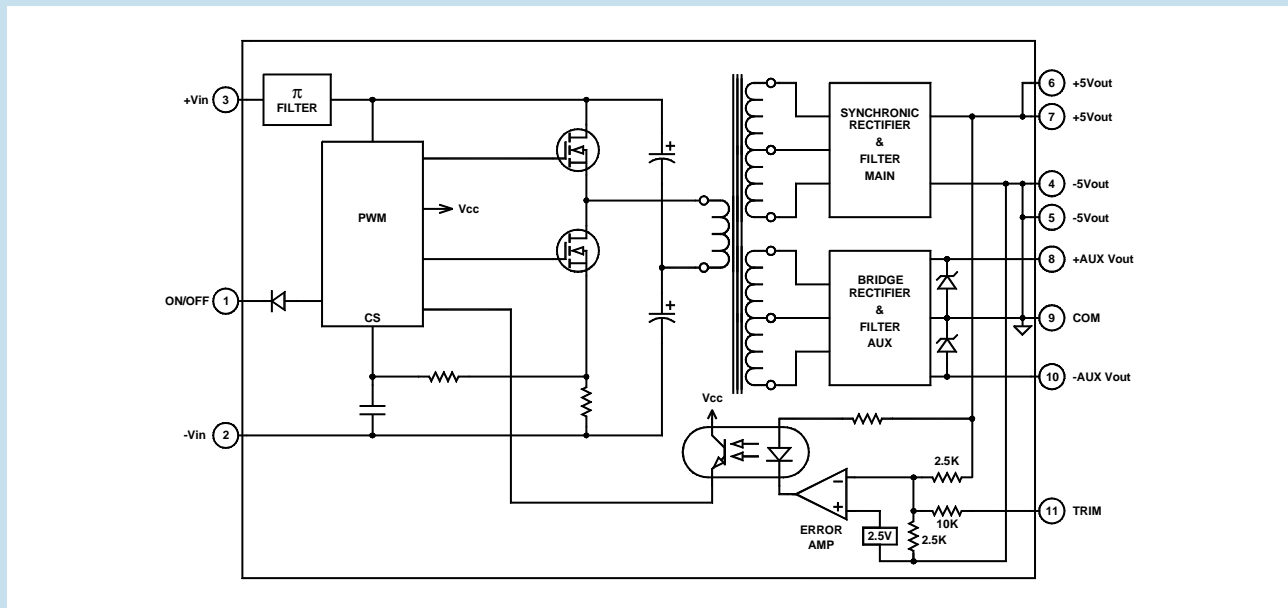
### Key Features

- Efficiency up to 90%
- Input-to-output isolation
- Soft start
- Triple output
- Short circuit protection
- 2mA off-state current
- Wide input voltage range (140–180Vdc)
- Six-sided shielding
- Thermal protection
- Output overvoltage protection



### Functional Description

The HV60000 is a 60W high-voltage DC/DC converter that accepts 140–180V<sub>IN</sub> and provides 5V<sub>OUT</sub>@6A and ±15V<sub>OUT</sub>@1A. Half bridge topology (the negative Main output (5V<sub>OUT</sub>) and the common of the ±Auxiliaries are internally connected through a solder gap), 100kHz switching frequency and synchronous rectification at its Main output (5V<sub>OUT</sub>) allow the converter to operate efficiently over a wide input range. The converter is packaged in a 3.00×2.56×0.75-inch metal case that offers improved thermal performance and reliability. Incorporates technology from Beta Dyne's US Patent 6,262,901 B1.



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		140	160	180	Vdc
Input Startup Voltage		100			Vdc
Input Filter	$\pi$				
Reverse Polarity	External series-blocking diode				
No Load Input Current			10		mA
Full Load Input Current	$V_{IN} = 160V$		417		mA
Input Surge Current (20 $\mu$ S Spike)				10	A
Short Circuit Current Limit	Hiccup mode		150		% $I_{IN}$
Undervoltage Shutdown			60		Vdc
Off State Current			2		mA
Remote ON/OFF Control					
Supply ON	Open ON/OFF Pin (Open circuit voltage: 12V Max.)		5.5		Vdc
Supply OFF		0		0.8	Vdc
Logic Input Reference	-Input				
Logic Compatibility	TTL Open Collector or CMOS Open Drain				

### OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Voltage, Main		4.75	5.00	5.25	Vdc
Voltage, Auxiliary			$\pm 15$		Vdc
Current, Main			6	8	A
Current, Auxiliary	Minimum load of 10% will improve accuracy	0.1		1	A
Output Voltage Accuracy, Main			$\pm 1$	2	%
Output Voltage Accuracy, Auxiliary	Main & Aux fully loaded		3	$\pm 5$	%
Output Voltage Adjustment	Single only, Aux track main		3	$\pm 5$	%
Voltage Balance, Auxiliary	Balanced loads for auxiliary		$\pm 2$	$\pm 3$	%
Minimum Load	For auxiliaries only	10			% of FL
Ripple & Noise	(See App. Note DC-003)		1	2	% $V_{PP}$ of $V_{OUT}$
Line Regulation, Main	Minimum $V_{IN}$ to maximum $V_{IN}$		$\pm 1$	2	%
Line Regulation, Auxiliary	Minimum $V_{IN}$ to maximum $V_{IN}$		$\pm 5$		%
Load Regulation, Main	NL to FL		$\pm 1$		%
Load Regulation, Auxiliary	Main fully loaded (See Figure 2)		$\pm 5$		%
Temperature Coefficient @ FL			0.02		%/°C
Transient Recovery Time (to within $\pm 1\%$ )	50% FL to FL to 50% FL; See Figure 1		50	100	$\mu$ S
Short Circuit Protection	All outputs, by input current limiting				
Output Short Circuit Duration	Continuous (Hiccup mode)				
Overvoltage Protection, Main	By second feedback		6.8		Vdc
Overvoltage Protection, Auxiliary	Shunt zener diodes		$\pm 18$		Vdc

### GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency (at full power)			90		%
Isolation Voltage (1 min.)			1500		Vdc
Isolation Resistance			$10^9$		$\Omega$
Isolation Capacitance			1000		pF
Switching Frequency			100		kHz

### PHYSICAL CHARACTERISTICS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Dimensions (LxWxH)	3.00x2.56x0.75in. (76.20x65.02x19.05mm)				
Weight	7.87oz. (223g)				
Case Material	Coated metal				
Shielding Connection	Input GND				

## ENVIRONMENTAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature Range	Case temperature	-40		+100	°C
Storage Temperature Range		-55		+125	°C
Thermal Resistance			2	3	°C/W <sub>DISS</sub>
Turn Off Case Temperature			120	140	°C
Thermal Hysteresis		10	20	30	°C
EM/RFI	Six-sided continuous shielded metal case				
MTBF	per MIL-HNBK-217F (Ground benign, +25°C)		400,000		hours

For additional information, see our application notes: DC-001: Testing Transient Response in DC/DC Converters and DC-002: Common-mode Filters for DC/DC Converters.

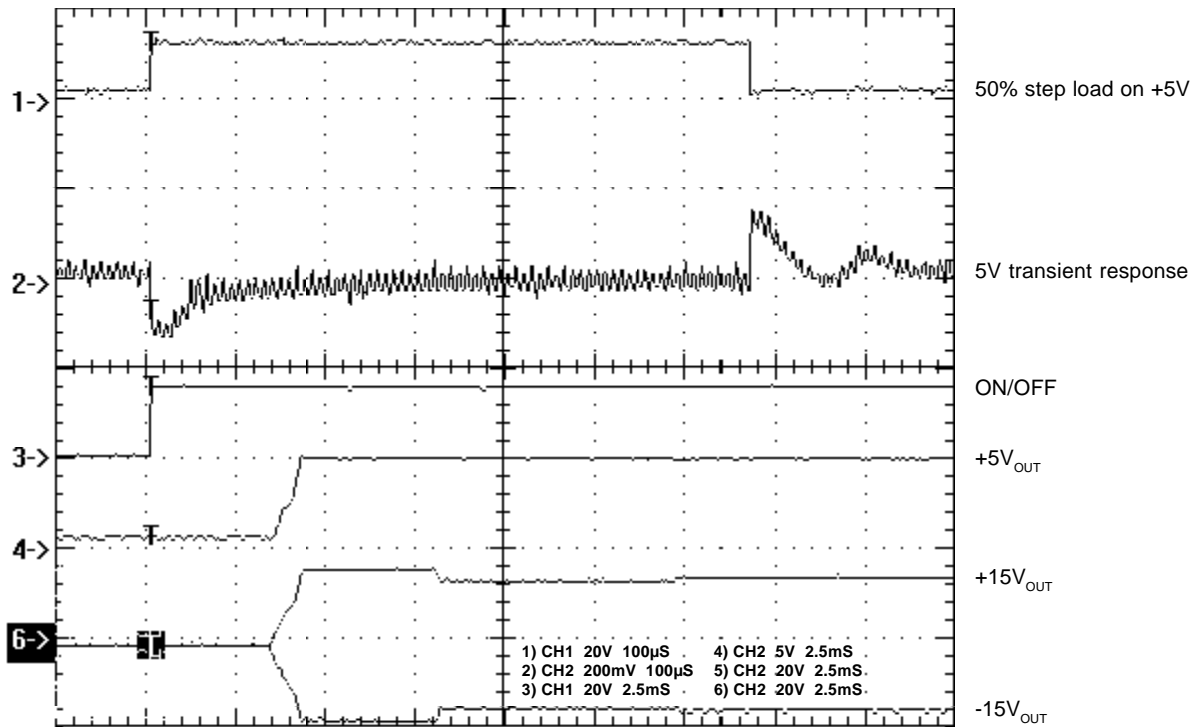


FIGURE 1. Transient response and turn on delay with soft start

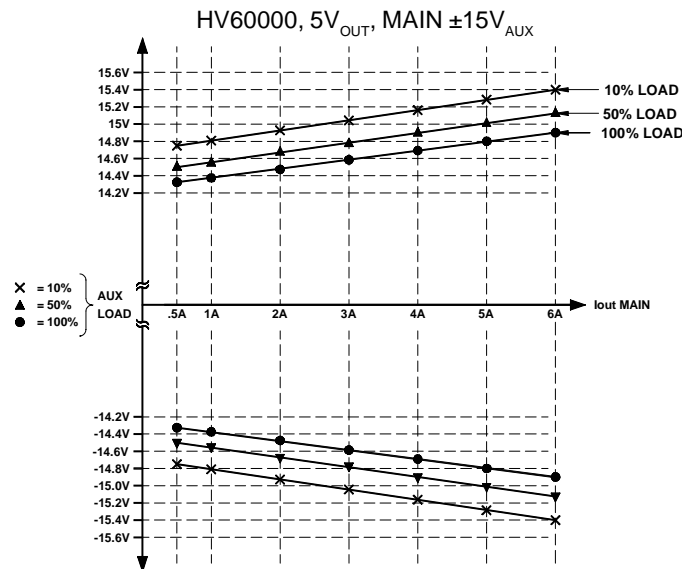


FIGURE 2. Graph of typical load regulation of a Triple Output. Deviation in % of  $\pm V_{AUX}$  vs. Main output loading.

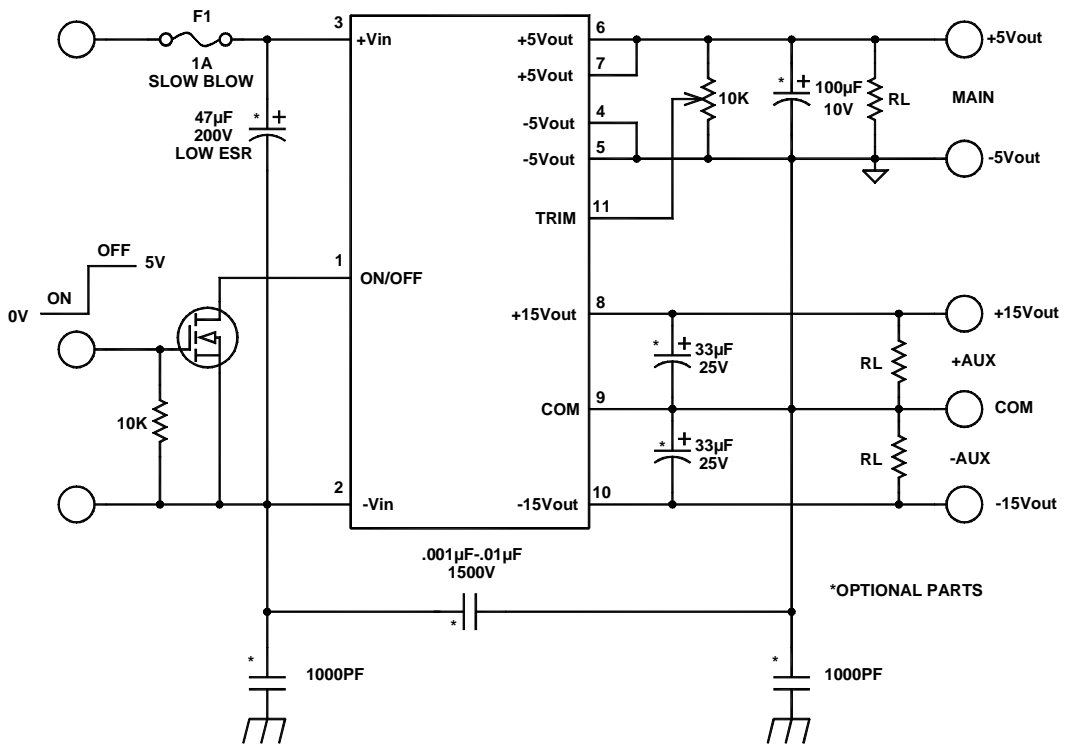
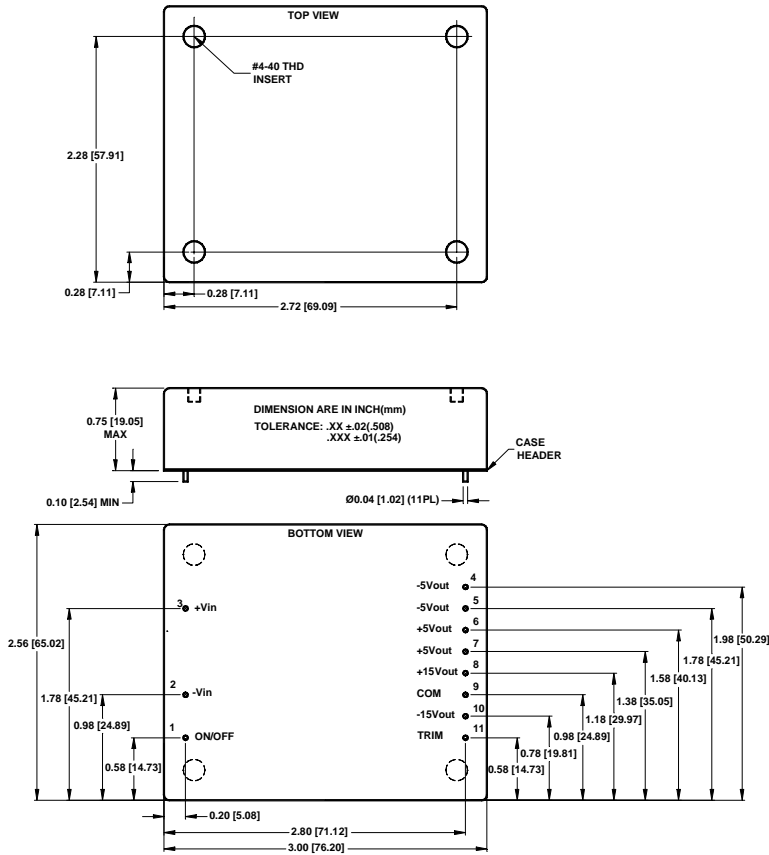


FIGURE 3. Typical connection diagram

### MECHANICAL SPECIFICATIONS



Pin	Function
1	ON/OFF
2	-V <sub>IN</sub>
3	+V <sub>IN</sub>
4	-5V <sub>OUT</sub> *
5	-5V <sub>OUT</sub> *
6	+5V <sub>OUT</sub>
7	+5V <sub>OUT</sub>
8	+15V <sub>OUT</sub>
9	COM (±15V)*
10	-15V <sub>OUT</sub>
11	TRIM

\* -5V<sub>OUT</sub> and COM (±15V) are internally connected