

150W Isolated DC/DC Converter for Distributed Power Applications

by Jack Palczynski, MSEE

This Design Note describes a compact, isolated 150W, 12V converter designed for 30V to 60V DC input voltages. The UC3828 is used as the main PWM, and the UC3907 load share IC is utilized in the output section as part of the control loop. This allows parallel operation of several modules equally sharing the total output current. Switching frequency for this converter is 250kHz and common, standard parts are utilized. A parts list and schematic describe the circuit. By varying components, one can see the various functions of the UC3828. Substitution of parts will result in a design which may suit other requirements. To more fully understand the design and specifications of this demo board, please refer to applications note U-147.

sign and enhance protection in a PWM controlled power supply. The IC is turned on when the ENABLE pin rises above 2.1V and off when below 2.0V. The SHUTDN pin provides added protection by shutting off the IC when greater than 1.5V is present on the pin. The pulse by pulse current limit of 1V is enhanced by a 1.5V shutdown feature. Outputs are actively held low when the IC is below the UVLO threshold or when a shutdown has been activated. Soft start is programmed by a single capacitor. In addition, the maximum duty cycle is accurately programmed in the clock set up and programmable leading edge blanking can eliminate problems usually associated with current turn on spikes. The IC runs on a wide range of input voltages up to 65V and the output is separately powered and limited to 12.4V by an internal regulator. The 5.1V reference is regulated to 2% and the current sense limit held to 5%.

INTRODUCTION

The UC3828 features provide functions to ease de-

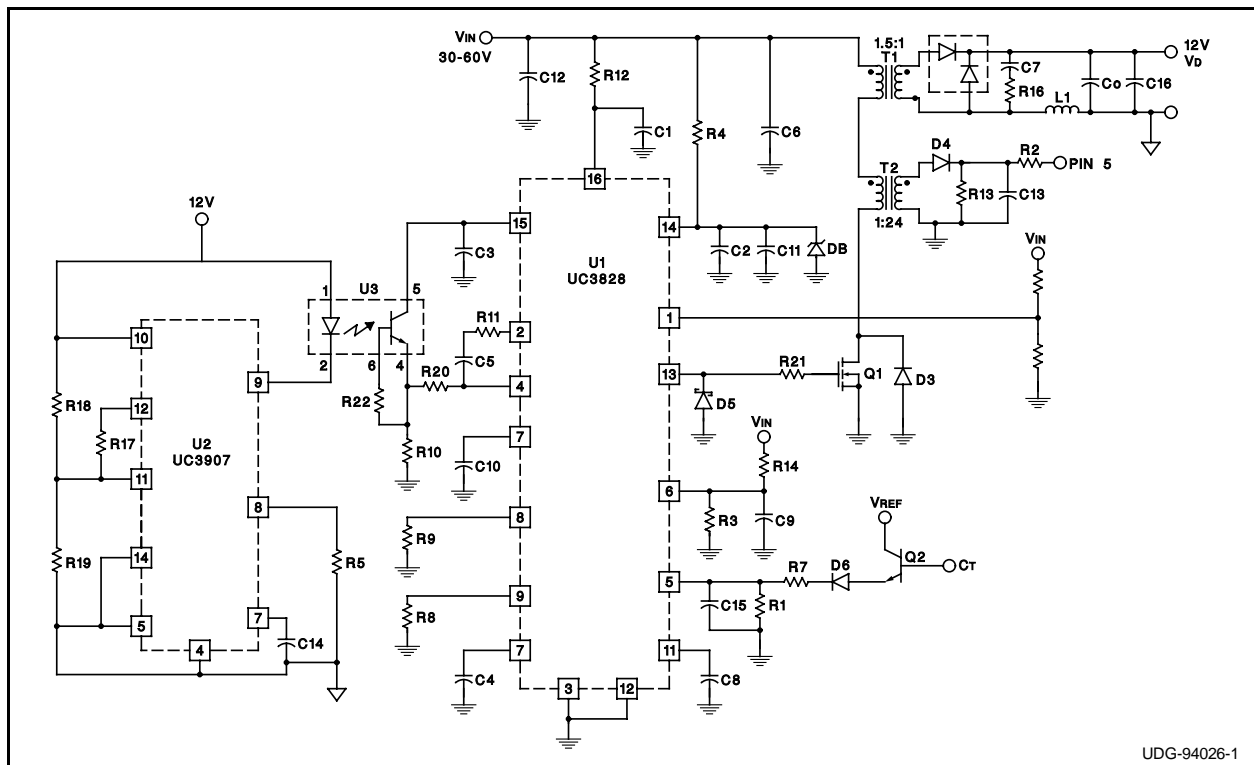
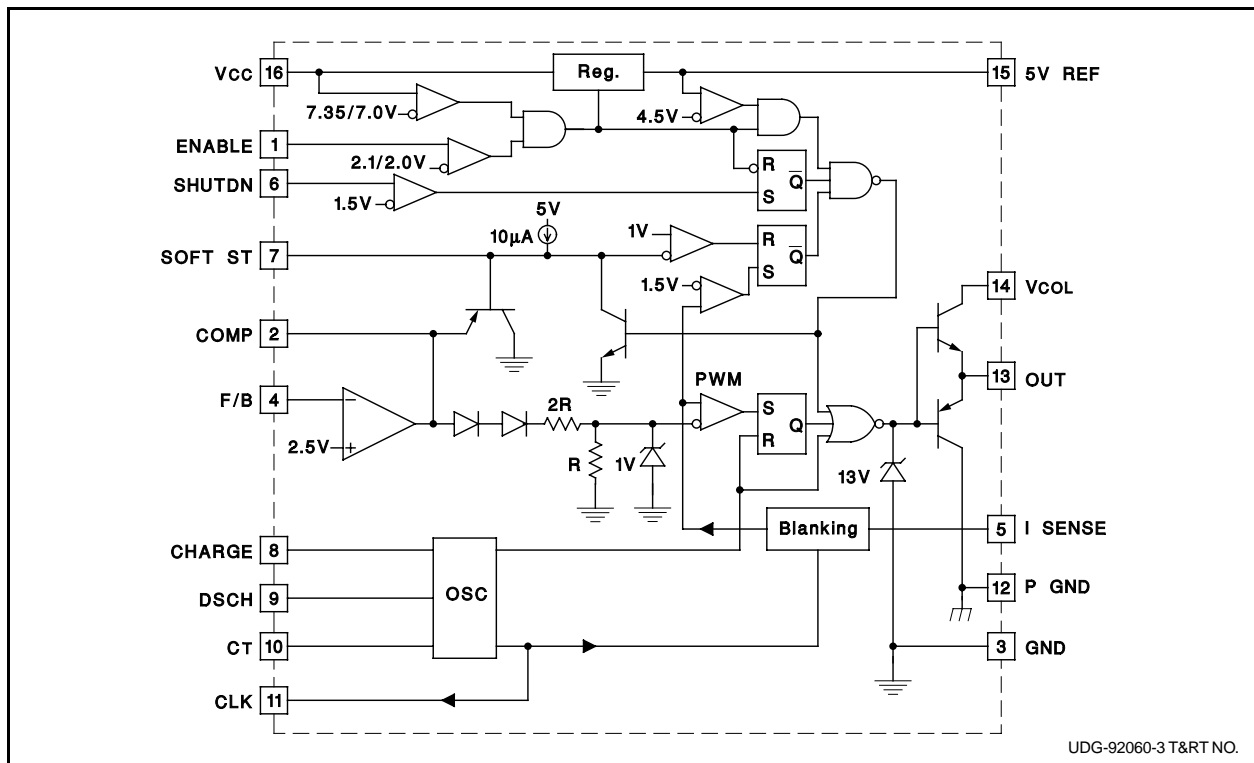


Figure 1. Circuit Schematic



UDG-92060-3 T&RT NO.

Figure 2. UC3828 Block Diagram

PARTS LIST

Co	Use 3 Sprague 595D476X0020	R3,R4,R11,R19	1k
	47 μ F, 20V Phone (207)324-4140	R5,R10	270
C1-C3,C5	0.1 μ F, 50V ceramic	R6	10k
C13,C14,C16	0.1 μ F, 50V ceramic	R7	9.3k
C4	180pF, 50V	R8	60k
C6	1 μ F, 100VAC	R9	15k
C7	470pF, 50V	R12	1k, 2W
C8-C10	47pF, 50V	R13	5.1, 2W
C11	10 μ F, 20V	R14	44.2k
C12	100 μ F, 100V	R15	132k
C15	390pF, 50V	R16	20 ohm, 1/2W
D1	MUR3020WT	R17	499k
D3,D4	1N5614	R18	4.99k
D5	UC3612	R20	12.1k
D6	1N4148	R21	10 ohm
D8	15V Zener	R22	1Meg
L1	ECI M-1138 Phone (413)562-7684	T1	Multisource T100-DC-6-1/10 Phone (617)890-1787
Q1	MTP20N20E Phone (602)244-3467	T2	Current Transformer 1:24
Q2	2N2222	U1	Unitrode UC3828
R1	1.8k	U2	Unitrode UC3907
R2	1.4k	U3	CNY-17A

An efficiency near 85% is achieved at full load with a 48V input. A spread sheet may be set up to account for various losses in the switch, magnetics and asso-

ciated circuitry in order to choose a switching frequency and other parameters suitable for other applications.

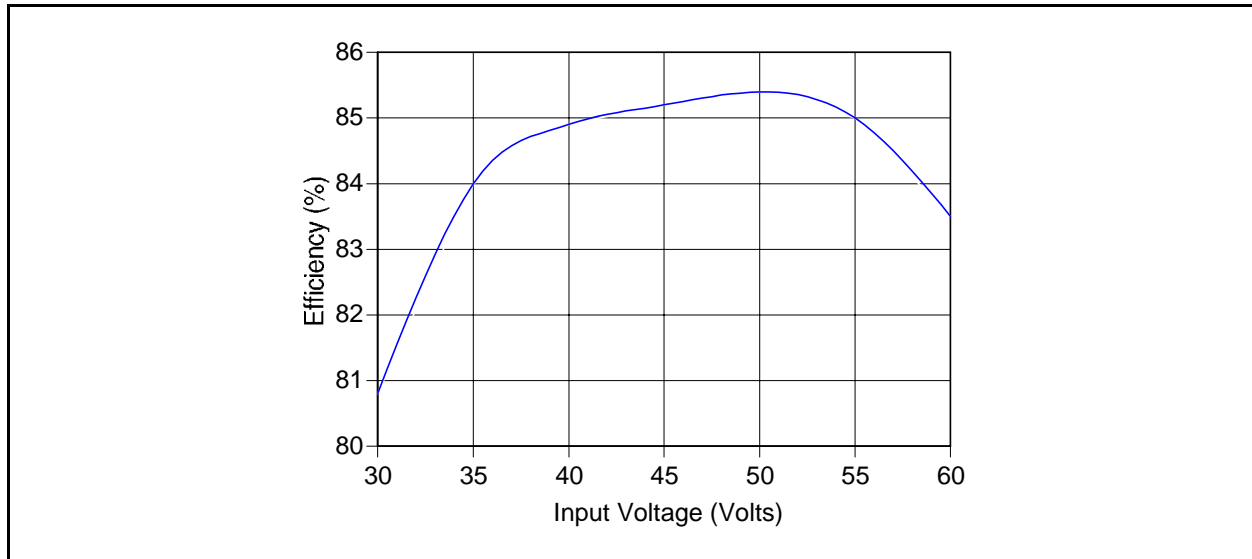


Figure 3. Efficiency vs. Input Voltage

RESULTS

The converter will run with a large heat sink and no forced air at ambient temperatures in the 25 degree C range at full load. Output ripple and noise are less than 100mV peak to peak and regulation is better than 2% over line and load. Minimum load is 1A and the converter will protect itself in the event of a short circuit. This can be demonstrated by increasing the output load and observing that the output voltage falls when peak current limit is triggered. Likewise, if the enable pin is held high, the max duty cycle limit will be reached and the output voltage will drop as input voltage is lowered.

REFERENCES

- [1] J. Palczynski, "UC3828 Provides Improvements and Added Features Over the UC3842" Unitrode Applications Note U-147.
- [2] P. Todd, "Snubber Circuits: Theory, Design and Application" Unitrode Seminar SEM-900 Topic 2.
- [3] W. Andreyca, "1.5 MHz Current Mode IC Controlled 50 Watt Power Supply" Unitrode Applications Note U-110.