



UCC3813 Dual Output Boost Converter

Reference Design

UCC3813 Dual Output Boost Converter

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System Power

ABSTRACT

The traditional boost converter is modified to provide bipolar 25-V outputs from a 5-V supply. Using the UCC3813–3 low power economy BiCMOS current mode pulse width modulator to control the basic boost converter building block, the minus 25-V output is generated by capacitively coupling the switching node.

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1 Introduction

Various low power applications require bipolar 25-V supplies derived from a single 5-V input. The following reference design is a modified simple boost converter using the UCC3813–3 low power economy BiCMOS current mode PWM. The design generates 25 V at 100 mA from the main output and –25 V at 100 mA from a capacitively coupled output. An input range which can vary from 4.5 V to 5.5 V is used to power the front end. The operating frequency is configured to be approximately 200 kHz.

3 List of Materials

REFERENCE	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER
C1, C8	2	Capacitor, ceramic, 1 μ F, 16 V, X5R, \pm 10%, 0805	Std	Std
C2	1	Capacitor, ceramic, 100 μ F, 6.3 V, X5R, \pm 15%, 1812	TDK	C4532X5R0J107M
C3, C5	2	Capacitor, ceramic, 330 pF, 50 V, NPO, \pm 5%, 0805	Std	Std
C4	1	Capacitor, ceramic, 10 nF, 50 V, X7R, \pm 10%, 0805	Std	Std
C6	1	Capacitor, ceramic, 0.1 μ F, 50 V, X7R, \pm 10%, 0805	Std	Std
C7, C9	2	Capacitor, ceramic, 10 μ F, 6.3 V, X5R, \pm 10%, 1206	Std	Std
C10	1	Capacitor, ceramic, 33 pF, 50 V, NPO, \pm 5%, 0805	Std	Std
C11	1	Capacitor, ceramic, 1 μ F, 50 V, X7R, \pm 10%, 1206	Std	Std
C12, C13, C14, C15	4	Capacitor, ceramic, 22 μ F, 25 V, X5R, \pm 20%, 1812	TDK	C4532X5R1E226M
D1	1	Diode, signal, 300 mA, 75 V, SOD-123	Diodes, Inc.	1N4148W
D2	1	Diode, super fast rectifier, 1 A, 35 V, SMA	Diodes, Inc.	ES1A
D3, D4	2	Diode, schottky, 500 mA, 20 V, SMini2-F1	Panasonic	MA2ZD18
L1	1	Inductor, RM8, F core material, 35 μ H, RM5	Std	Std
Q1	1	Bipolar, NPN, 40 V, 200 mA, SOT23	Std	MMBT3904LT1
Q2	1	Bipolar, PNP, 60 V, 150 mA, SOT23	Std	MMBT2907A
Q3	1	MOSFET, N-channel, 20 V, 13 A, 8.0 m Ω , PWRPAK S0-8	Vishay/ Siliconix	Si7368DP
R1	1	Resistor, chip, 23.2 k Ω , 1/10 W, \pm 1%	Std	Std
R2	1	Resistor, chip, 2.0 k Ω , 1/10 W, \pm 1%, 0805	Std	Std
R3	1	Resistor, chip, 442 Ω , 1/10 W, \pm 1%, 0805	Std	Std
R4	1	Resistor, chip, 49.9 k Ω , 1/10 W, \pm 1%, 0805	Std	Std
R5	1	Resistor, chip, 4.42 k Ω , 1/10 W, \pm 1%, 0805	Std	Std
R6	1	Resistor, chip, 15 k Ω , 1/10 W, \pm 1%, 0805	Std	Std
R7	1	Resistor, chip, 80.6 Ω , 1/10 W, \pm 1%, 0805	Std	Std
R8	1	Resistor, chip, 1 k Ω , 1/10 W, \pm 1%, 0805	Std	Std
R9	1	Resistor, chip, 0.25 Ω , 1 W, \pm 1%, 2512	Vishay/Dale	WSL-2512
R10	1	Resistor, chip, 2.1 k Ω , 1/10 W, \pm 1%, 0805	Std	Std
R11	1	Resistor, chip, 51 Ω , 1/10 W, \pm 1%, 0805	Std	Std
U1	1	IC, Low-Power BiCMOS Current-Mode PWM, SO8	Texas Instruments	UCC3813-3D

4 Electrical Characteristics

PARAMETER		MIN	TYP	MAX	UNITS
V_{IN} , input voltage	V_{IN}	4.5	5.0	5.5	V
V_{OUT} , output voltage	$V_{OUT}(\text{main})$	24.5	25	25.5	
	$V_{OUT}(\text{aux})$	-24.5	-25	-25.5	
P_{OUT} , total output power	P_{OUT}	0.5		5	W
V_{RIPPLE} , peak-to-peak output ripple	V_{RIPPLE}			250	mV
Switching frequency	f_{SW}		200		kHz

5 Reference Design Performance

The following figures illustrate this reference design's performance.

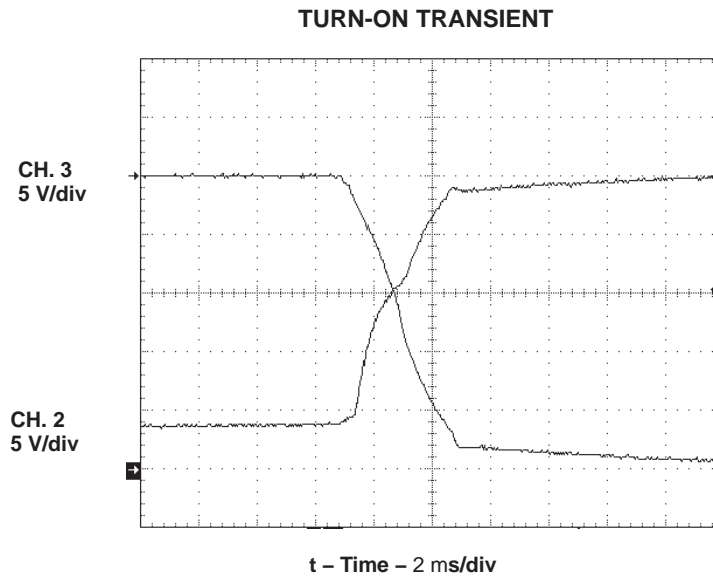


Figure 2. Channel 2: +25-V main output. Channel 3: -25-V auxiliary output.

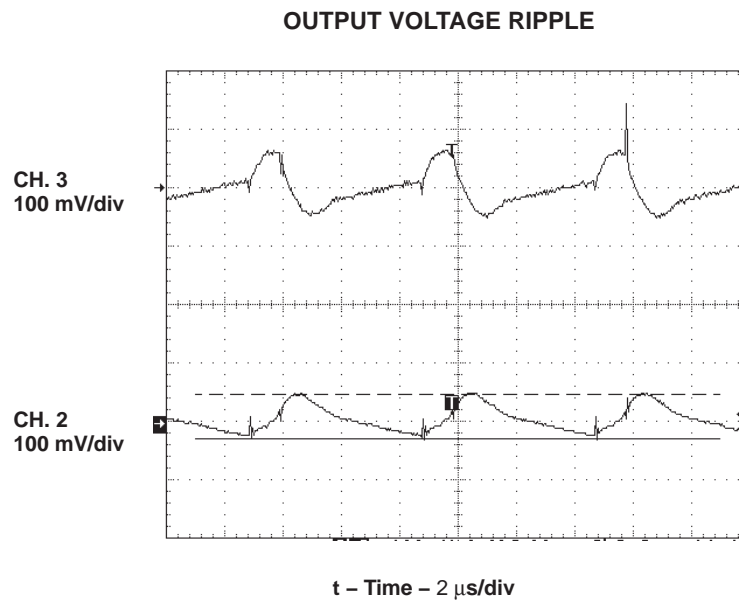


Figure 3. Channel 2: +25-V main output. Channel 3: -25-V auxiliary output.

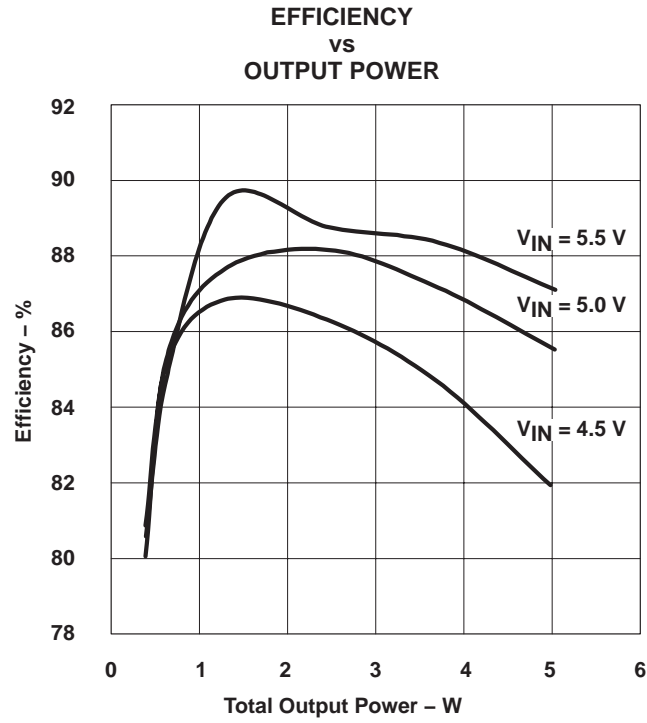


Figure 4

6 References

Dinwoodie, Lisa, *Dual Output Boost Converter*, SLUA288, Texas Instruments, April 2003

UCC3813-0/-1/-2/-3/-4/-5 Low Power Economy BiCMOS Current Mode PWM, Product Folder, Texas Instruments

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