

## DESCRIPTION

Demonstration circuit 663 is a 2-phase dual synchronous high efficiency step-down DC/DC converter with 2.7V to 8V input range. It has two outputs: 2.5V (5A MAX at 5V input) and 1.8V (5A MAX at 5V input). The demo board features the LTC®3736EUF controller. The constant frequency current mode architecture with MOSFET  $V_{DS}$  sensing eliminates the need for sense resistors and improves efficiency. Out of phase operation significantly reduces peak input ripple current; thereby reducing the noise and input capacitor size.

Switching frequency is internally set at 550kHz. For noise sensitive applications, the converter can be externally synchronized from 250kHz to 850kHz. The frequency can also be selected with PLLLPF pin. Tying PLLLPF pin to GND selects 300kHz operation; tying PLLLPF pin to VIN selects 750kHz operation.

The demo circuit has output tracking, allowing  $V_{OUT2}$  to track  $V_{OUT1}$  during start-up.

**Design files for this circuit board are available. Call the LTC factory.**

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**Table 1. Performance Summary ( $T_A = 25^\circ\text{C}$ )**

PARAMETER	CONDITION	VALUE
Input Voltage Range		2.7V to 8V
$V_{OUT1}$	$V_{IN} = 5\text{V}$ , $I_{OUT1} = 0\text{A to } 5\text{A}$ , $I_{OUT2} = 0\text{A to } 5\text{A}$	2.5V $\pm 3\%$
$V_{OUT2}$	$V_{IN} = 5\text{V}$ , $I_{OUT1} = 0\text{A to } 5\text{A}$ , $I_{OUT2} = 0\text{A to } 5\text{A}$	1.8V $\pm 3\%$
Typical Output Ripple $V_{OUT1}$	$V_{IN} = 3.3\text{V}$ , $I_{OUT1} = 3\text{A}$ (20MHz BW)	18mV <sub>p-p</sub>
Typical Output Ripple $V_{OUT2}$	$V_{IN} = 3.3\text{V}$ , $I_{OUT2} = 3\text{A}$ (20MHz BW)	26mV <sub>p-p</sub>
Typical Switching Frequency	PLLLPF Pin Floating	550kHz

## QUICK START PROCEDURE

Demonstration circuit 663 is easy to set up to evaluate the performance of the LTC3736. Refer to Figure 1. for proper measurement equipment setup and follow the procedure below:

**NOTE:** When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the Vin or Vout and GND terminals. See Figure 2. for proper scope probe technique.

1. With power off, connect the input power supply to Vin (2.7V-8V) and GND (input return).
2. Connect the 2.5V load (Load 1 in Figure 1.) between Vout1 and GND; connect the 1.8V load (Load 2 in Figure 1.) between Vout2 and GND. (Initial loads: no load.)
3. Connect the DVMs to the input and outputs.
4. Turn on the input power supply and check for the proper output voltages. Vout1 should be 2.5V $\pm$ 3%. Vout2 should be 1.8V $\pm$ 3%.

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 663 2-PHASE DUAL SYNCHRONOUS STEP-DOWN CONVERTER WITH OUTPUT TRACKING

5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.

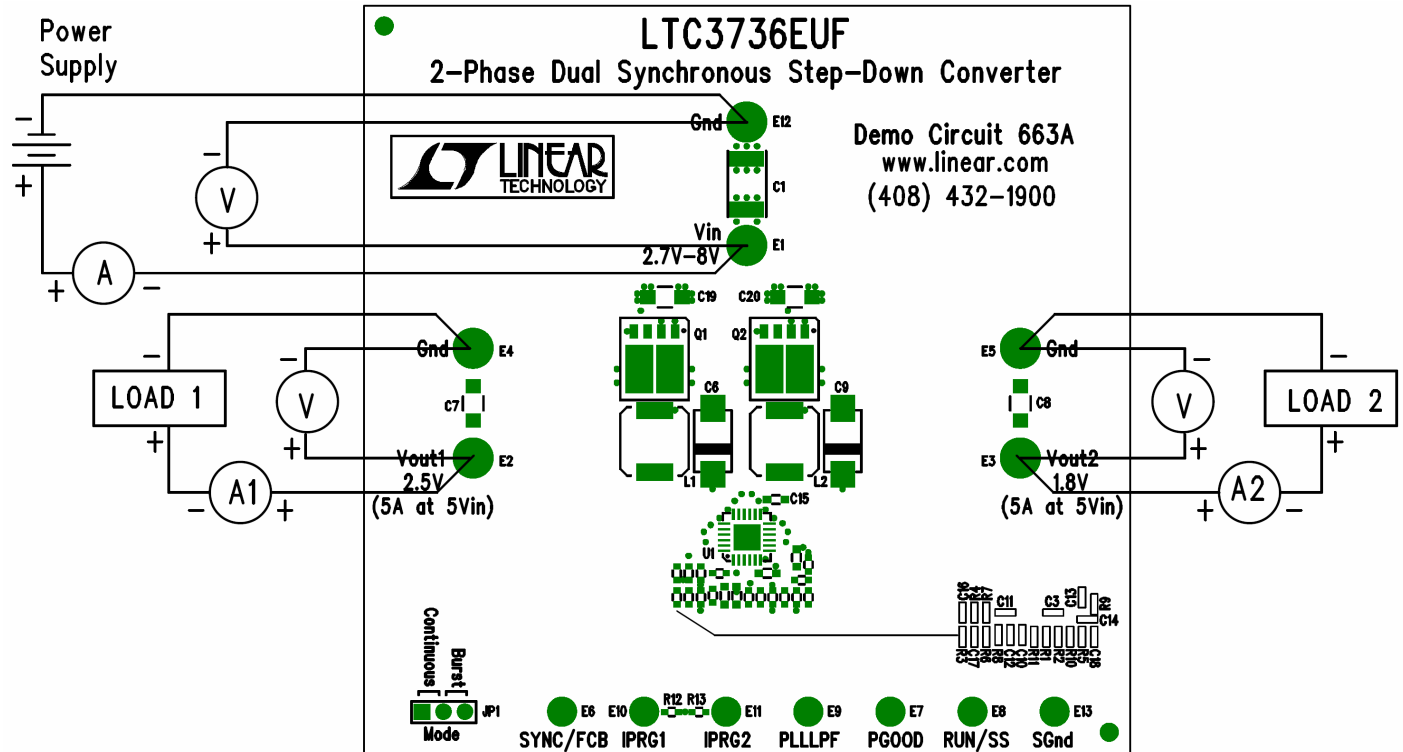
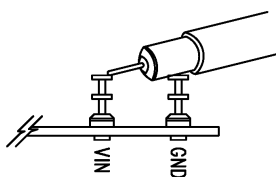


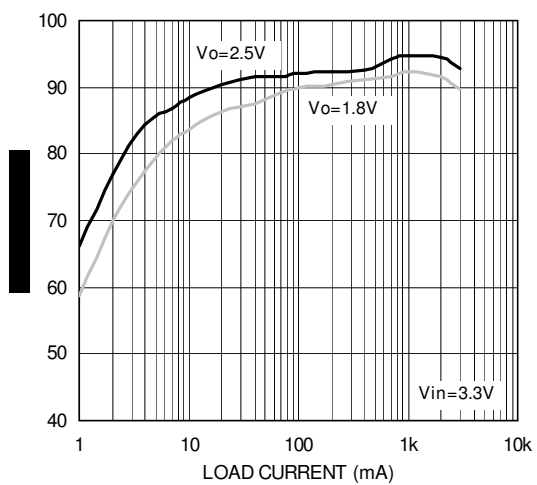
Figure 1. Proper Measurement Equipment Setup

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 663

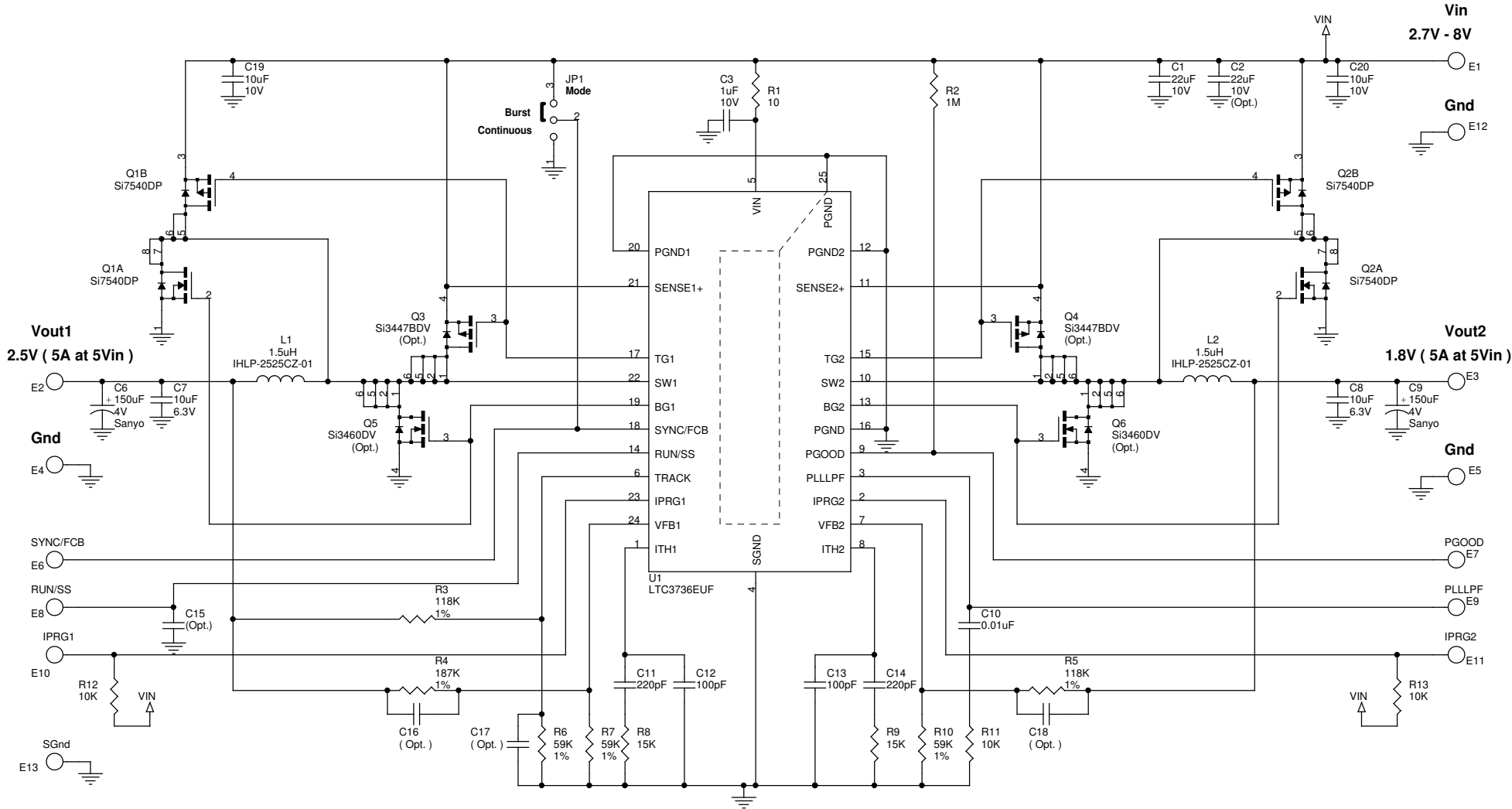
## 2-PHASE DUAL SYNCHRONOUS STEP-DOWN CONVERTER WITH OUTPUT TRACKING



**Figure 2. Scope Probe Placement for Measuring Input or Output Ripple**



**Figure 3. Efficiency vs Load Current (Burst Mode, 550kHz)**



NOTES: UNLESS OTHERWISE SPECIFIED

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1630 McCARTHY BLVD. MILPITAS, CA. 95035 408-432-1900 408-434-0507 FAX	
Title <b>LTC3736EUF 2-Phase Dual Synchronous Step-Down Converter</b>	
Size	Document Number <b>DEMO 663A LTC3736EUF</b>
Date:	Monday, December 01, 2003 Sheet 1 of 1

Item	Qty	Reference	Part Description	Manufacture / Part #
1	2	C12,C13	CAP., X7R, 100pF 50V	AVX, 04025C101MAT 0402
2	2	C11,C14	CAP., X7R, 220pF 50V	AVX, 04025C221MAT 0402
3	1	C10	CAP., X7R, 0.01uF 25V	AVX, 04023C103MAT 0402
4	1	C3	CAP., X5R, 1uF 10V	TAIYO YUDEN, LMK107BJ105MA 0603
5	2	C7,C8	CAP., X7R, 10uF 6.3V	TAIYO TUDEN, JMK316BJ106ML 1206
6	2	C19,C20	CAP., X5R, 10uF 10V	TDK, C3216X5R1A106KT
7	1	C1	CAP., X7R, 22uF 10V	TAIYO YUDEN, LMK432BJ226MM 1812
8	2	C6,C9	CAP., POSCAP, 150uF, 4V	SANYO, 4TPB150MC C-CASE
9	0	C2,C15-C18	OPTION	
10	7	E6-E11,E13	TURRET, TEST PIN, .061"	MILL-MAX 2308-2-00-44 (counted)
11	6	E1-E5,E12	TURRET, TEST PIN, .095"	MILL-MAX 2501-2 (counted / sealed)
12	1	JP1	JUMPER, 0.079"CC, 3PIN	COMM CON, 2802S-03G2
13	1	JP1	SHUNT	COMM CON, CCIJ2MM-138GW
14	2	L1,L2	INDUCTOR, 1.5uH	VISHAY, IHLP-2525CZ-01-1.5
15	2	Q1,Q2	N-and -P MOSFET 12-V (D-S)	VISHAY, Si7540DP POWERPAK SO-8
16	0	Q3,Q4 (OPTIONAL)	P-MOSFET 12-V (D-S)	VISHAY, Si3447BDV TSOP-6
17	0	Q5,Q6 (OPTIONAL)	N-MOSFET 20-V (D-S)	VISHAY, Si3460DV TSOP-6
18	1	R1	RES., CHIP, 10 1/16W 5%	AAC, CR05-100JM 0402
19	3	R11-R13	RES., CHIP, 10K 1/16W 5%	AAC, CR05-103JM 0402
20	2	R8,R9	RES., CHIP, 15K 1/16W 5%	AAC, CR05-153JM 0402
21	3	R6,R7,R10	RES., CHIP, 59K 1/16W 1%	AAC, CR05-5902FM 0402
22	1	R2	RES., CHIP, 1M 1/16W 5%	AAC, CR05-105JM 0402
23	2	R3,R5	RES., CHIP, 118K 1/16W 1%	AAC, CR05-1183FM 0402
24	1	R4	RES., CHIP, 187K 1/16W 1%	AAC, CR05-1873FM 0402
25	1	U1	I.C., LTC3736EUF	LINEAR, LTC3736EUF QFN24