

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 664

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

### LTC3737EUF

## DESCRIPTION

Demonstration circuit 664 is a high efficiency 2-phase dual step-down DC/DC converter with 2.75V to 9.8V input range. It has two outputs: 2.5V/2.5A and 1.8V/3A. The demo board features the constant frequency current mode LTC<sup>®</sup>3737EUF controller. The MOSFET  $V_{DS}$  sensing eliminates the need for sense resistors and improves efficiency. Out of phase operation significantly reduces input ripple current and noise as well as the input capacitor size.

Switching frequency is internally set at 550KHz. For noise sensitive applications, the converter can be ex-

ternally 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 board has tracking function, 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		2.75V to 9.8V
$V_{OUT1}$	$V_{IN} = 2.75\text{V to } 9.8\text{V}$ , $I_{OUT1} = 0\text{A to } 2.5\text{A}$ , $I_{OUT2} = 0\text{A to } 3\text{A}$	2.5V $\pm 3\%$
$V_{OUT2}$	$V_{IN} = 2.75\text{V to } 9.8\text{V}$ , $I_{OUT1} = 0\text{A to } 2.5\text{A}$ , $I_{OUT2} = 0\text{A to } 3\text{A}$	1.8V $\pm 3\%$
Typical Output Ripple $V_{OUT1}$	$V_{IN} = 3.3\text{V}$ , $I_{OUT1} = 2.5\text{A}$ (20MHz BW)	14mV <sub>P-P</sub>
Typical Output Ripple $V_{OUT2}$	$V_{IN} = 3.3\text{V}$ , $I_{OUT2} = 3\text{A}$ (20MHz BW)	19mV <sub>P-P</sub>
Typical Switching Frequency	PLLLPF Pin Floating	550kHz

## QUICK START PROCEDURE

Demonstration circuit 664 is easy to set up to evaluate the performance of LTC3737. 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 (2.75V-9.8V) 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: 0A.)
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%.

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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.

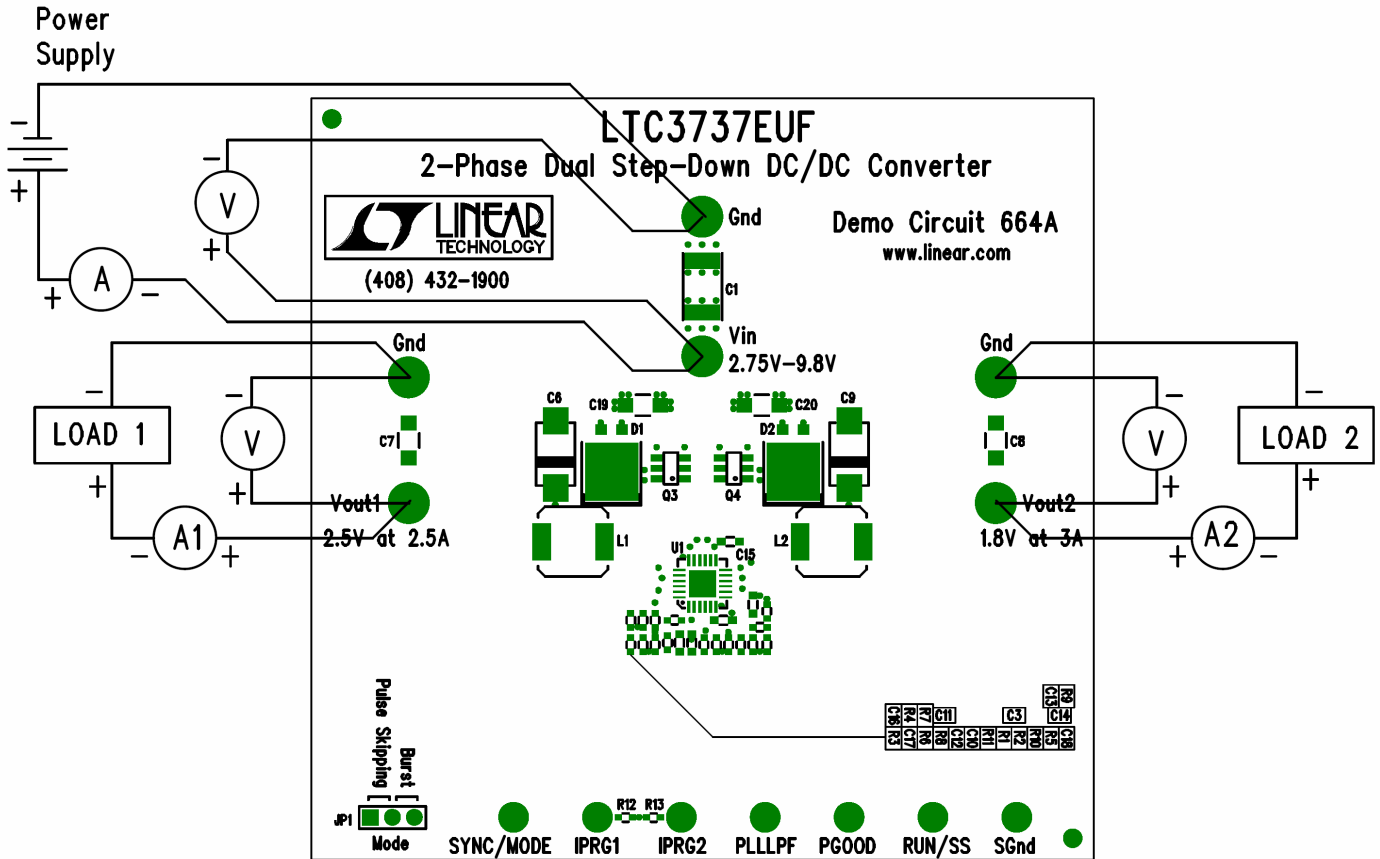


Figure 1. Proper Measurement Equipment Setup

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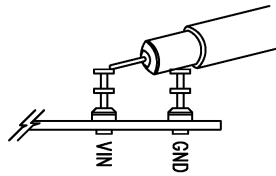


Figure 2. Scope Probe Placement for Measuring Input or Output Ripple

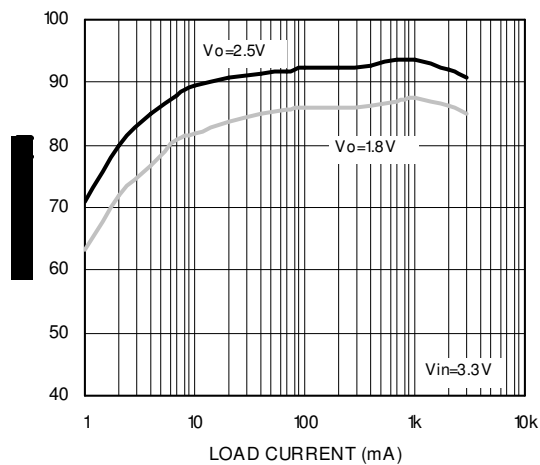
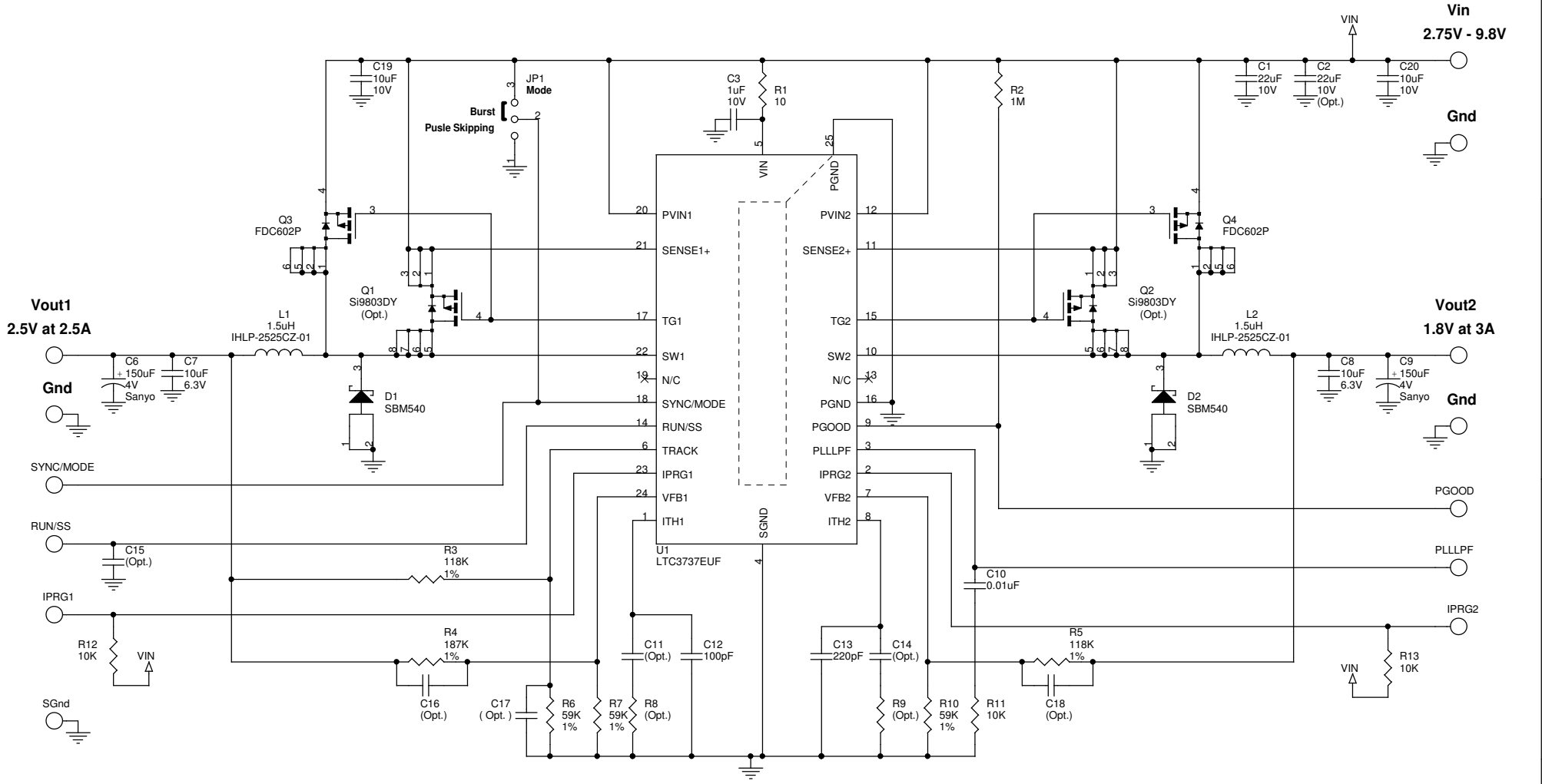


Figure 3. Efficiency vs Load Current (Burst Mode, 550kHz)



NOTES: UNLESS OTHERWISE SPECIFIED

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Linear Technology Has Made A Best Effort To Design A Circuit That Meets Customer-Supplied Specifications; However, It Remains The Customer's Responsibility To Verify Proper And Reliable Operation In The Actual Application. Component Substitution And Printed Circuit Board Layout May Significantly Affect Circuit Performance Or Reliability. Contact Linear Technology Applications Engineering For Assistance. This Circuit Is Proprietary To Linear Technology And Supplied For Use With Linear Technology Parts.	
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DEMO CIRCUIT 664A LTC3737EUF	
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Item	Qty	Reference	Part Description	Manufacture / Part #
1	4	C12,C13,C16,C18	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 1206
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,C17	OPTION	
10	2	D1,D2	DIODE, SCHOTTKY BARRIER RECTIFIER	DIODE INC., SBM540 POWERMITE-3
11	7	E6-E11,E13	TURRET, TEST PIN, .061"	MILL-MAX 2308-2-00-44
12	6	E1-E5,E12	TURRET, TEST PIN, .095"	MILL-MAX 2501-2
13	1	JP1	JUMPER, 0.079"CC, 3PIN	COMM CON, 2802S-03G1
14	1	JP1	SHUNT	COMM CON, CCIJ2MM-138G
15	2	L1,L2	INDUCTOR, 1.5uH	VISHAY, IHLP-2525CZ-01-1.5
16	0	Q1,Q2 ( OPTIONAL )	P-CHANNEL FAST SWITCHING MOSFET	VISHAY, Si9803DY S08
17	2	Q3,Q4	P-CHANNEL POWERTRENCH MOSFET	FAIRCHILD, FDC602P SUPERSOT-6
18	1	R1	RES., CHIP, 10 1/16W 5%	AAC, CR05-100JM 0402
19	3	R11,R12,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, 100K 1/16W 5%	AAC, CR05-104JM 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., LTC3737EUF	LINEAR, LTC3737EUF QFN24