DEMO MANUAL DC1771A

LTC3867EUF
Synchronous Buck Converter with Remote Sensing

DESCRIPTION

Demonstration circuit 1771A is a single output synchronous buck converter featuring the LTC®3867EUF with a 24-lead 4mm × 4mm QFN package.

The DC1771A is configured with a sense resistor. DCR sensing circuit is optional. Using the inductor's DCR as the sense element instead of the on-board sense resistor saves cost and board space while improving full-load efficiency over 2%, though the sense resistor provides a more accurate current limit.

The board has a lot of features including an internal 5V linear regulator for bias, output voltage remote sense, programmable nonlinear control to improve load transient performance, programmable thermal shutdown, optional temperature compensated DCR sense circuit, a mode selector that allows the converter to run in CCM, pulse-skipping or Burst Mode® operation. Synchronization to an external clock is also possible.

The input voltage range is from 4.5V to 14V. The LTC3867 data sheet gives a complete description of the part, operation and application information and must be read in conjunction with this demo manual for DC1771A.

Design files for this circuit board are available at http://www.linear.com/demo

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		4.5V ~ 14V
Output Voltage V_{OUT}	V_{IN} = 4.5V ~ 14V, I_{OUT} = 0A ~ 15A, JP3: CCM	1.5V ±2% (1.470V ~ 1.530V)
Default Operating Frequency		400kHz
External Clock Sync. Frequency Range		400kHz to 780kHz
Typical Full-Load Efficiency (See Figure 4)	V_{IN} = 12V, V_{OUT} = 1.5V, I_{OUT1} = 15A, f_{SW} = 400kHz	88.3%

QUICK START PROCEDURE

Demonstration circuit DC1771A is easy to set up to evaluate the performance of the LTC3867EUF. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical application:

   JP2 On

   JP3 CCM

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and VIN supply to 12V.

3. Turn on the power supply at the input.

NOTE: Make sure that the input voltage does not exceed 14V.

4. Check the output voltage. The output voltage should be between 1.470V and 1.530V.

Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, output voltage ripple, efficiency and other parameters.

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.

5. Change JP3 jumper position to select different operation modes. Set jumper to CCM, BURST or P.S. position toe set forced continuous conduction, burst or pulse-skipping mode respectively. For synchronizing to an external clock source, set the jumper to BURST position and apply the clock signal to MODE/PLLIN turret.

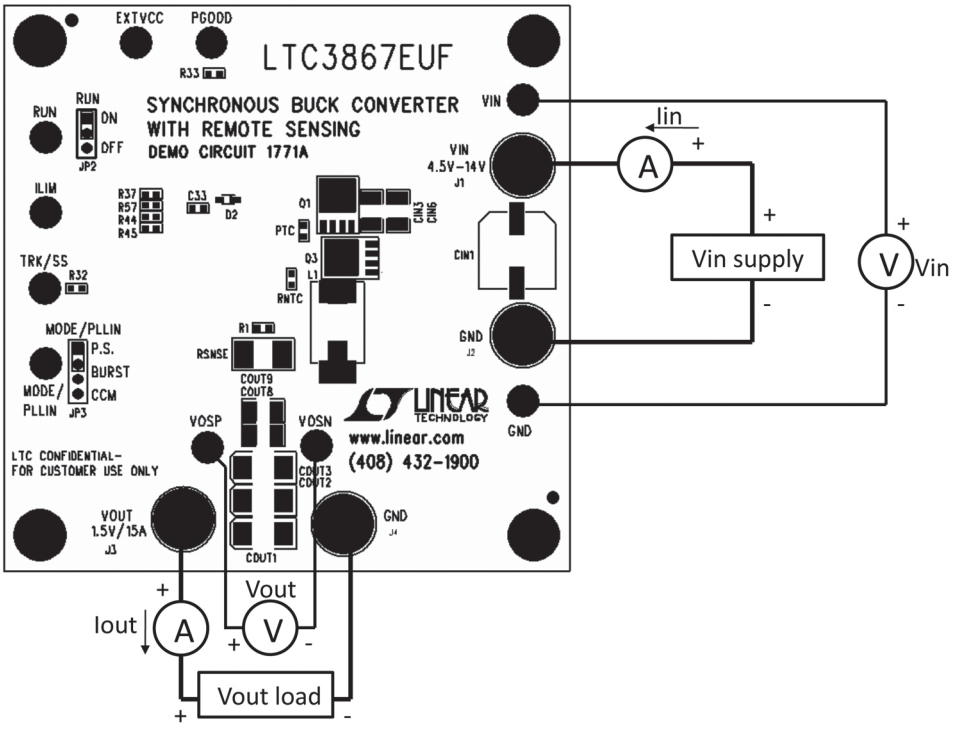


Figure 1. Test Setup of the DC1771A

RAIL TRACKING

Demonstration circuit 1771A is configured for an onboard soft-start circuit. The soft-start ramp rate can be adjusted by changing the value of C24. Demonstration circuit 1771A can also be modified to track an external reference. Refer to Table 1 for tracking options and to the data sheet for more details.

Table 2. Output Tracking Options

	TRK/SS RESISTORS AND CAPACITOR			RAIL TRACKING
CONFIGURATION	R32	R35	C24	TRK/SS PIN
Soft-Start Without Tracking (Default)	0Ω	Open	0.1µF	OPEN
VOUT Equals External Ramp	0Ω	Open	Open	External Reference Applied
VOUT Tracking Scaled External Ramp	Resistor Divider		Open	External Reference Applied

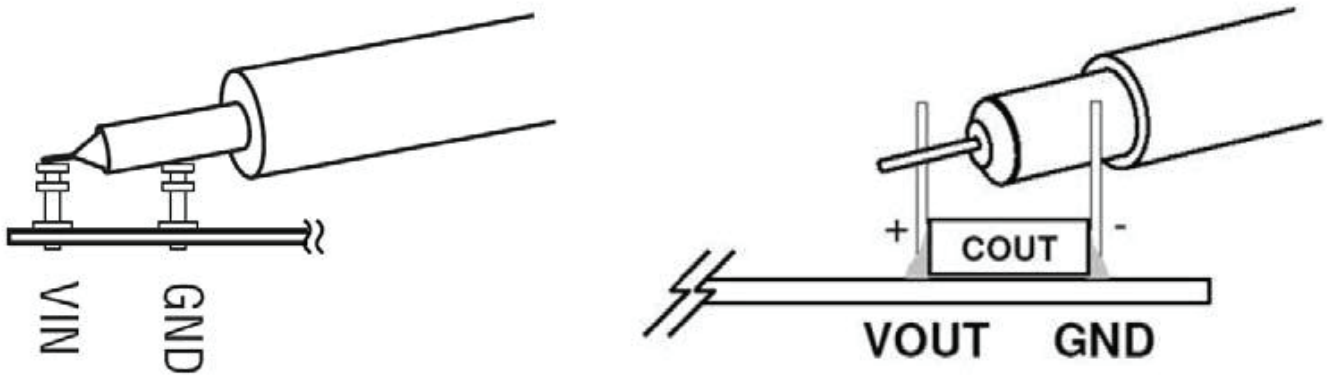


Figure 2. Measuring Input or Output Ripple Across Terminals or Directly Across Bulk Capacitor

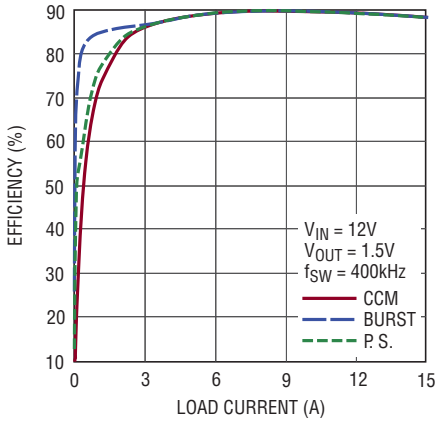
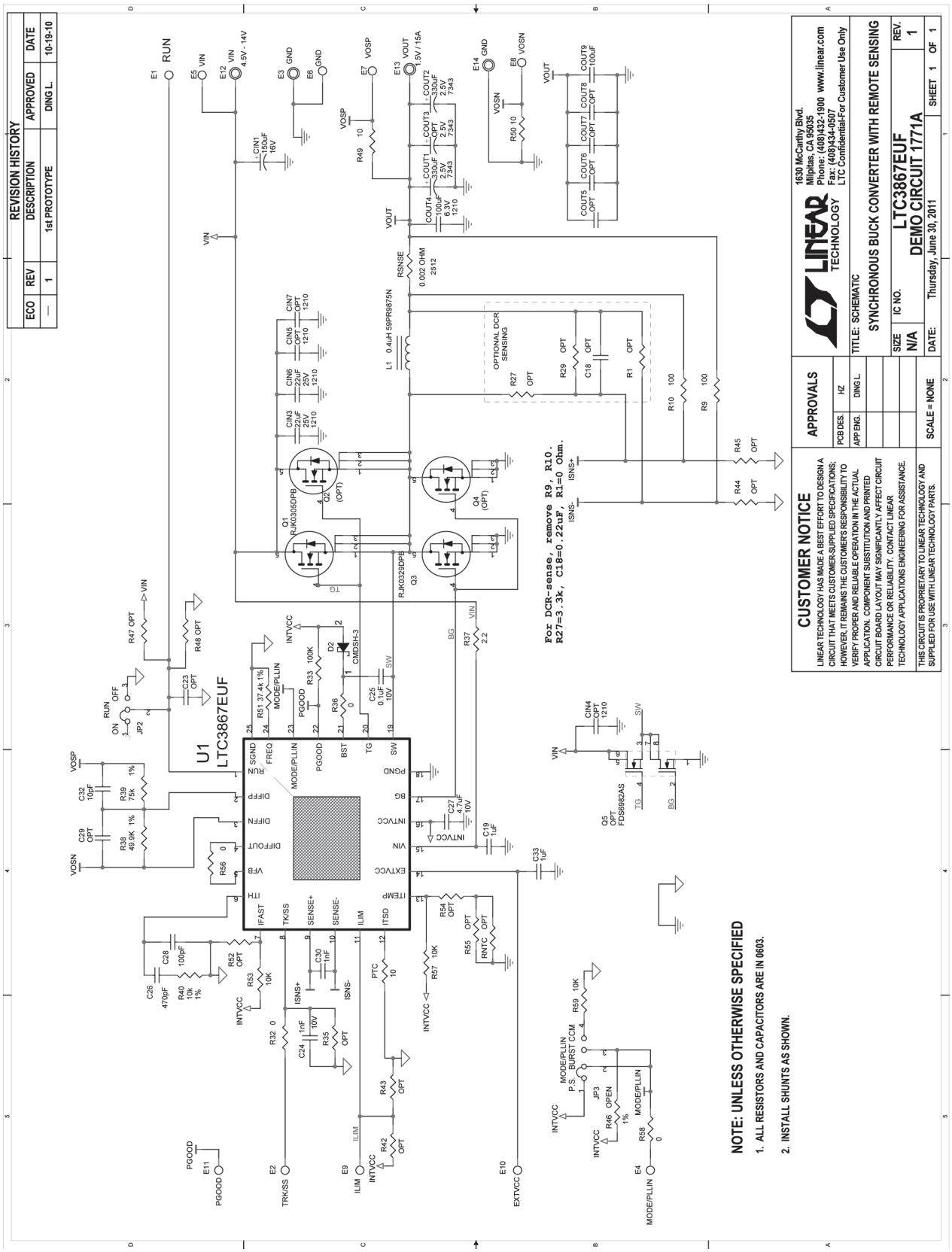


Figure 3. Measured Efficiency

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	CIN3, CIN6	CAP, X5R 22µF 20% 25V 1210	TAIYO YUDEN TMK325BJ226MM-T
2	2	COUT1, COUT3	CAP, 330µF 20% 2.5V POSCAP 7343	SANYO 2R5TPE330MF
3	2	COUT4, COUT9	CAP, X5R 100µF 20% 6.3V 1210	
4	2	C19, C33	CAP, X5R 1µF 10% 25V 0603	TDK C1608X5R1E105K
5	2	C24, C30	CAP, X7R 1nF 10% 25V 0603	AVX 06033C102KAT
6	1	C25	CAP, X5R 0.1µF 10% 10V 0603	AVX 0603ZD104KAT
7	1	C28	CAP, C0G 100pF 5% 50V 0603	TDK C1608C0G1H101J
8	1	C32	CAP, C0G 10pF 5% 50V 0603	TDK C1608C0G1H100J
9	1	C27	CAP, X5R 4.7µF 10% 10V 0603	
10	1	C26	CAP, C0G 470pF 5% 50V 0603	TDK C1608C0G1H471J
11	1	D2	DIODE, CMDSH-3 SOD-323	CENTRAL SEMI CMDSH-3-LTC
12	1	L1	IND., 0.4µH	VITEC 59PR9875
13	1	Q1	XSTR, MOSFET LFPAK	RENESAS RJK0305DPB
14	1	Q3	XSTR, MOSFET LFPAK	RENESAS RJK0329DPB
15	1	RSNSE	RES, 0.002Ω 5% 1/4W 2512	PANASONIC ERJM1WTJ2MOU
16	1	U1	IC, LTC3867EUF,QFN 4mm x 4mm	
17	4	R32, R36, R56, R58	RES, 0Ω JUMPER 0603	VISHAY CRCW06030000Z0EA
18	2	R9, R10	RES, 100Ω 1%, 1/10W 0603	VISHAY CRCW0603100RFKEA
19	1	R33	RES, 100k 1% 1/10W 0603	VISHAY CRCW0603100KFKEA
20	1	R37	RES, 2.2Ω 5% 1/10W 0603	VISHAY CRCW06032R20JNEA
21	1	R38	RES, 49.9k 1% 1/10W 0603	VISHAY CRCW060349K9FKED
22	1	R39	RES, 75k 1% 1/10W 0603	VISHAY CRCW060375KFKEA
23	1	R40	RES, 10k 1% 1/10W 0603	VISHAY CRCW060310KFKEA
24	1	R51	RES, 37.4KΩ 1% 1/10W 0603	VISHAY CRCW060337K4FKEA
25	6	R49, R50, R53, R57, R59, PTC	RES, 10Ω 1% 1/10W 0603	VISHAY CRCW060310R0FKEA
Additional Demo Board Circuit Components				
1	1	CIN1	CAP, 150µF 20% 16V	SANYO 16SVP150M
2	8	E1, E2, E4-E11	TESTPOINT, TURRET, 0.094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
3	4	E3, E12-E14	JACK BANANA	KEYSTONE, 575-4
Hardware-For Demo Board Only				
1	1	JP3	HEADER 4-PIN 0.079 SINGLE ROW	SAMTEC, TMM104-02-L-S
2	1	JP2	HEADER 3-PIN 0.079 SINGLE ROW	SAMTEC, TMM103-02-L-S
3	2	XJP2, XJP3	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G
4	4	(STAND-OFF)	STAND-OFF, NYLON 0.50"	KEYSTONE, 8832(SNAP ON)

SCHEMATIC DIAGRAM



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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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