

## DESCRIPTION

Demonstration circuit 667 is a high efficiency, high frequency buck converter, incorporating the LTC3416 monolithic synchronous regulator. DC667 operates in forced continuous operation and provides tracking of another power supply rail. It operates from an input voltage range of 2.25V to 5.5V and provides a regulated output voltage from 0.8V to 5V. DC667 can deliver high power – up to 4A of output current - in a relatively small circuit, thanks to 67mohm high cur-

rent power switches in the LTC3416. The LTC3416 also incorporates OPTI-LOOP compensation, so that the DC667 can be optimized to provide fast transient response over a wide range of line and load conditions. All these features make the DC667 perfectly suited for battery powered, hand-held applications.

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

## QUICK START PROCEDURE

Demonstration circuit DC667 is easy to set up to evaluate the performance of the LTC3416EFE. 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. Place jumper JP1 in the ON position.
2. Connect Jumper JP4 for 2.5V Output Voltage. Leave JP3, JP5 and JP6 unconnected.
3. With power off, connect the input power supply VIN to VIN and GND.
4. Connect TRACK terminal to VIN (JP2 to Off position), tracking function is disabled.
5. Apply input power at the VIN slowly, by increasing VIN from 0V to 5.5V.

**NOTE:** Make sure that the input voltage VIN does not exceed 5.5V.

6. Check for the output voltages  $V_{OUT} = 2.5V$   
If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
7. Once the proper output voltages are established, adjust the loads within 4A range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.
8. To test tracking functions, place JP2 to ON position, and connect TRACK terminal to 1.25V Voltage supply (through a voltage divider, the voltage on Track pin of the IC is about 550mV), the output voltage will be regulated at 1.75V.
9. Connect TRACK terminal to GND, the VOUT should be less than 200mV in normal operation.
10. To test 1.8V output voltage, connect JP3 and leave JP4, JP5 and JP6 unconnected. Repeat the procedure 3 to 7. Follow the similar procedure for other output voltage tests.

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC667

## 4A MONOLITHIC SYNCHRONOUS STEP-DOWN REGULATOR WITH TRACKING

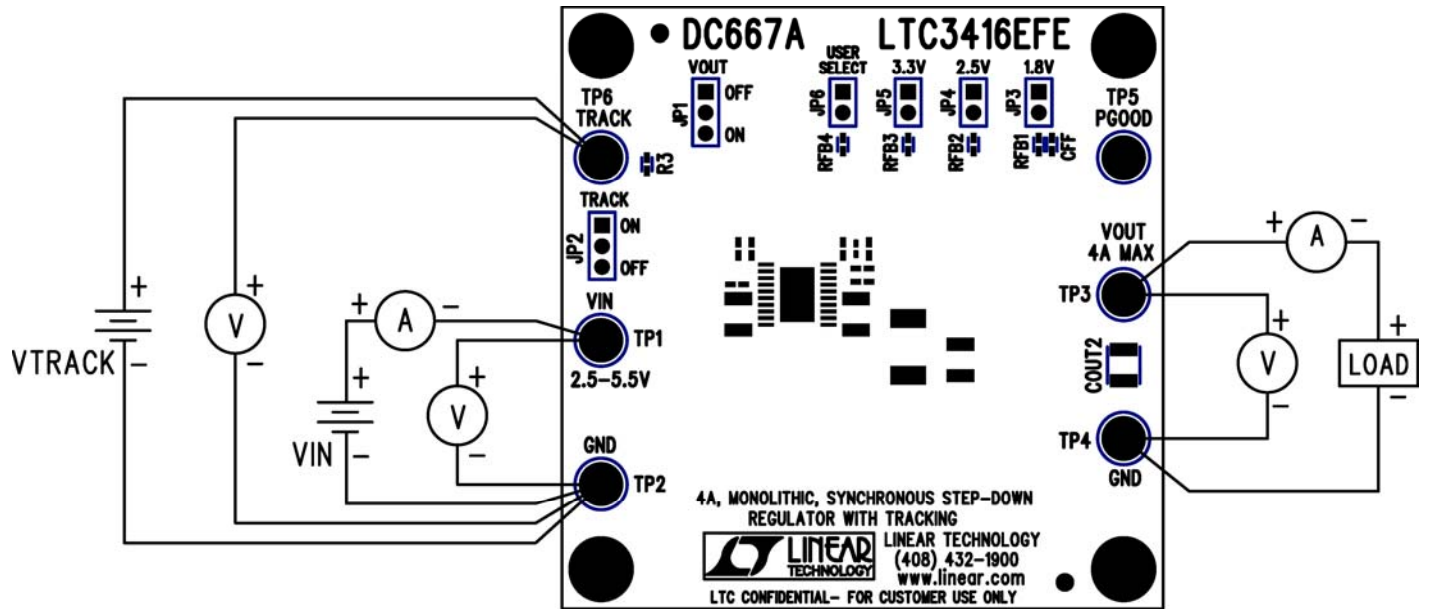


Figure 1. Proper Measurement Equipment Setup

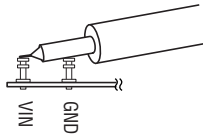
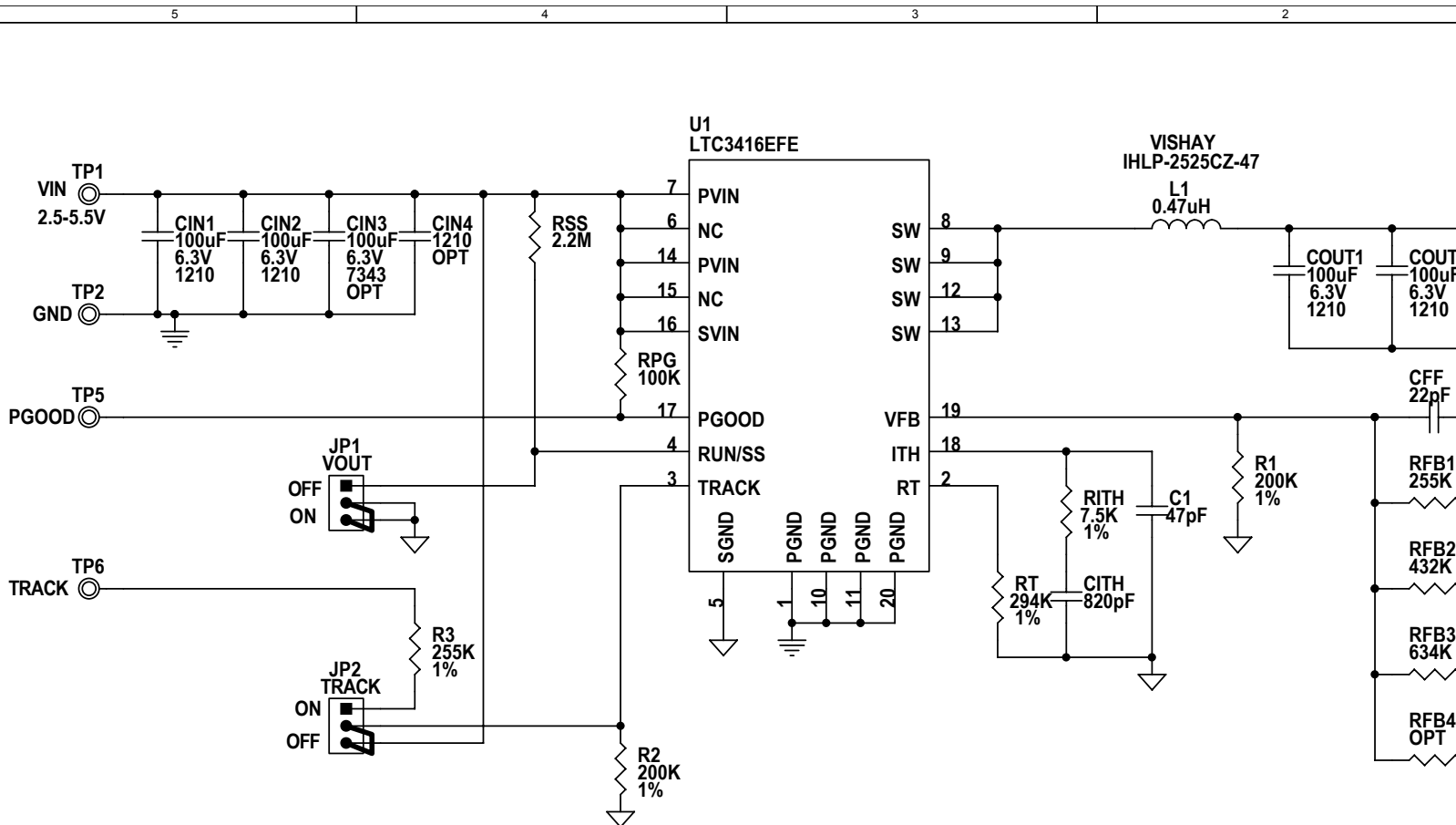
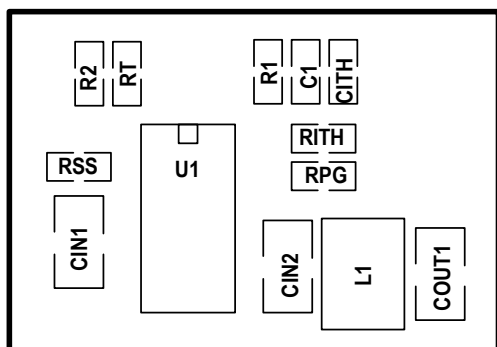


Figure 2. Scope Probe Placement for Measuring Input or Output Ripple



### BOARD LAYOUT



### NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0402.
2. ALL CAPACITORS ARE IN MICROFARAD, 0402.
3. INSTALL SHUNTS ON JP1 AND JP2 PIN 2 AND 3, JP4 PIN 1 AND 2.

### CUSTOMER NOTICE

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.

CONTRACT NO.

APPROVALS

DRAWN: KIM T.

CHECKED:

APPROVED:

ENGINEER:

DESIGNER: RAYMOND Z



TITLE: SCHEMATIC  
 4A, MONOLITHIC, SYN  
 REGULATOR

SIZE  
 A

DWG NO.

DC667A

DATE: Friday, January 09, 2004

# Linear Technology Corporation

LTC3416EFE

4A, MONOLITHIC, SYNCHRONOUS STEP-DOWN REGULATOR WITH TRACKING

ENG: RAYMOND ZHENG (23-30)

Item	Qty	Reference	Part Description	Manufacture / Pa
1	1	CFF	Cap., NPO 22pF 25V 10%	AVX 04023A220KAT2A
2	4	CIN1,CIN2, COUT1,COUT2	Cap., X5R 100uF 6.3V 20%,1210	TDK C3225X5R0J107M
3	0	<b>CIN3,COUT3 (OPT)</b>	<b>Cap., X5R 100uF 6.3V 20%,7343-1812</b>	<b>TDK C3225X5R0J107M</b> or POS
4	0	<b>CIN4 (OPT)</b>	<b>Cap., X5R,1210</b>	<b>OPT</b>
5	1	CITH	Cap., X7R 820pF 25V 20%	AVX 04023C821MAT2A
6	1	C1	Cap., NPO 47pF 25V 10%	AVX 04023A470KAT2A
7	0	<b>C2 (OPT)</b>	<b>Cap., NPO 39pF 25V 10%</b>	<b>AVX 04023A390KAT2A</b>
8	2	JP1,JP2	Headers, 3 Pins 2mm Ctrs.	CommConn Con. Inc. 2802S-03
9	4	JP3,JP4,JP5,JP6	Jumper, 2pins 2mm Ctrs.	CommConn Con. Inc. 2802s-02
10	3	SHUNTS FOR JP1,JP2,JP4	Shunt, 2 Pins 2mm Ctrs.	CommConn Con. Inc. CCIJ2MM
11	1	L1	Inductor, 0.47uH	VISHAY IHLP-2525CZ-47
12	2	RFB1,R3	Res., Chip 255K 1/16W 1%	AAC CR05-2553FM
13	1	RFB2	Res., Chip 432K 1/16W 1%	AAC CR05-4323FM
14	1	RFB3	Res., Chip 634K 1/16W 1%	AAC CR05-6343FM
15	0	<b>RFB4,RFB5</b>	<b>Jumper, Chip 0 1/16W 5%</b>	<b>OPT</b>
16	1	RITH	Res., Chip 7.5K 1/16W 1%	AAC CR05-7501FM
17	1	RPG	Res., Chip 100K 0.06W 5%	AAC CR05-104JM
18	1	RSS	Res., Chip 2.2M 1/16W 5%	AAC CR05-225JM
19	1	RT	Res., Chip 294K 0.06W 1%	AAC CR05-2943FM
20	2	R1,R2	Res., Chip 200K 1/16W 1%	AAC CR05-2003FM
21	0	<b>R4 (OPT)</b>	<b>Res., Chip 1K 0.06W 5%</b>	<b>AAC CR05-102JM</b>
22	6	TP1-TP6	Turret, Testpoint	Mill Max 2501-2
23	1	U1	I.C., Step-Down Reg., TSSOP20FE	Linear Tech. Corp. LTC3416EFE
24	4		SCREW, #4-40, 1/4"	ANY
25	4		STANDOFF, #4-40 1/4"	MICRO PLASTICS 14HTSP10
26	1	STENCIL FOR TOP SIDE		

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