

## LTC3646/LTC3646-1

### High Efficiency Low Quiescent Current Step-Down Converter

## DESCRIPTION

Demonstration circuit 1731A-A/1731A-B is a step-down DC/DC converter using LTC3646/LTC3646-1 monolithic synchronous buck regulator. The input voltage range is from 4V to 40V. The output voltage range of LTC3646 is 2V to 30V, for LTC3646-1 is 0.6V to 15V. It can deliver up to 1A of output current. At light load conditions, DC1731A can operate in Burst Mode<sup>®</sup> operation to improve the efficiency. The user can choose to use internal or external compensation. The switching frequency of LTC3646/LTC3646-1 is programmable from 200kHz to 3MHz. It can

be synchronized to an external clock through the MODE/SYNC pin. The LTC3646/LTC3646-1 data sheet must be read in conjunction with this demo manual prior to working on or modifying demonstration circuit 1731A.

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

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## PERFORMANCE SUMMARY

Specifications are at  $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		4V to 40V
Output Voltage $V_{OUT}$	Jumper Selectable	3.3V, 5V
Maximum Continuous Output Current		1A
Default Operating Frequency		1.5MHz
Efficiency	$V_{IN} = 12\text{V}, V_{OUT} = 5\text{V}, I_{OUT} = 1\text{A}$	91.0% See Figure 3
Load Transient	$V_{IN} = 12\text{V}, V_{OUT} = 5\text{V}$	See Figure 4

# DEMO MANUAL

## DC1731A-A/DC1731A-B

### QUICK START PROCEDURE

Demonstration circuit 1731A is an easy way to evaluate the performance of the LTC3646/LTC3646-1. 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:

MODE	EXTVCC	RUN	V <sub>OUT</sub> SELECT
FCC	GND	ON	3.3V

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V<sub>IN</sub> supply to be 0V.

- Turn on the power at the input. Increase V<sub>IN</sub> to 12V (**Do not hot-plug the input supply or apply more than the rated maximum voltage of 40V to the board or the part may be damaged**). The output voltage should be regulated and deliver the selected output voltage ±2%.
- Vary the input voltage from 4V to 40V and adjust the load current from 0A to 1A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.
- To measure input or output ripple, please refer to Figure 2 for proper measurement setup.

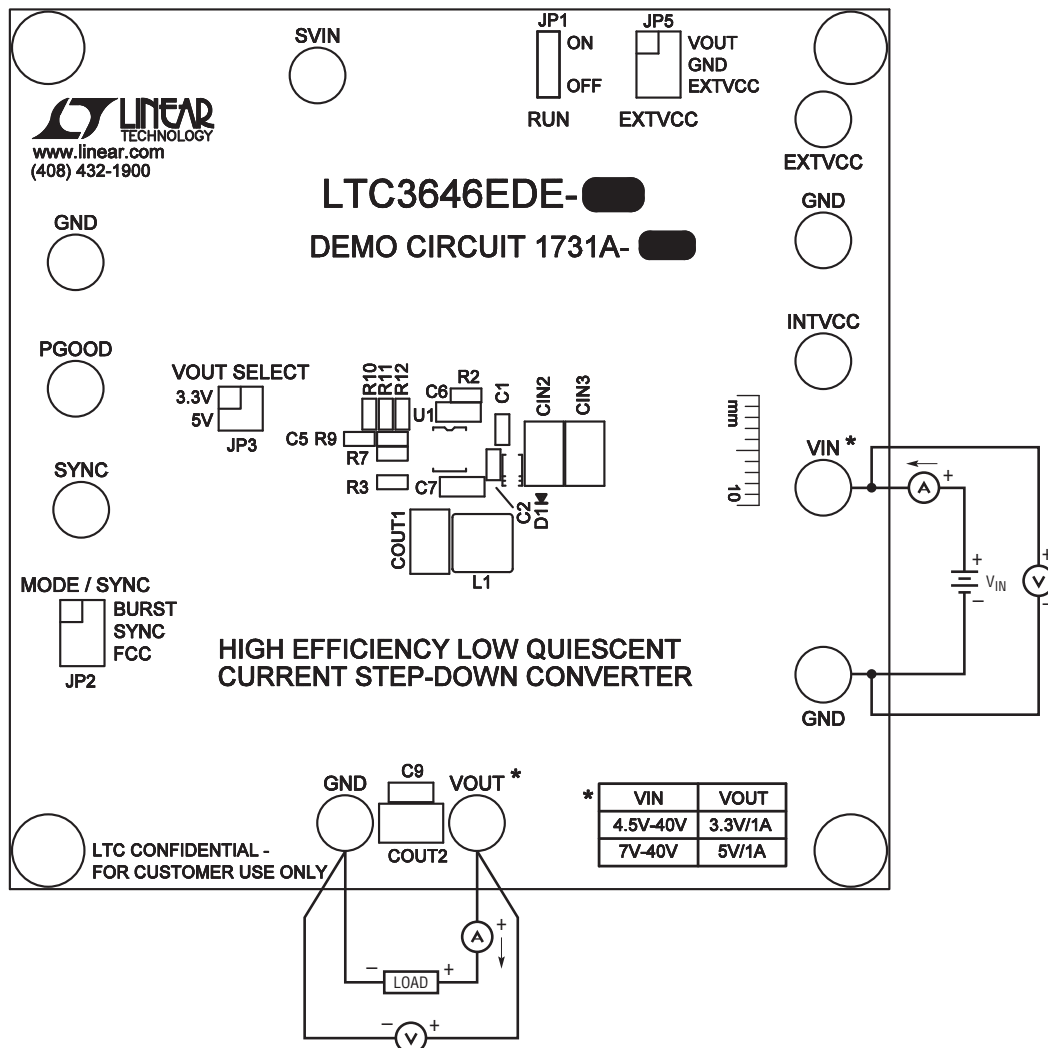


Figure 1. Proper Measurement Equipment Setup

## QUICK START PROCEDURE

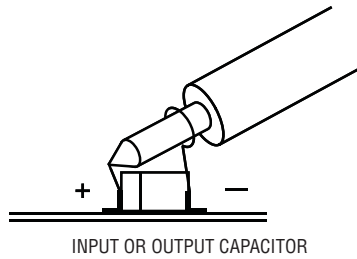
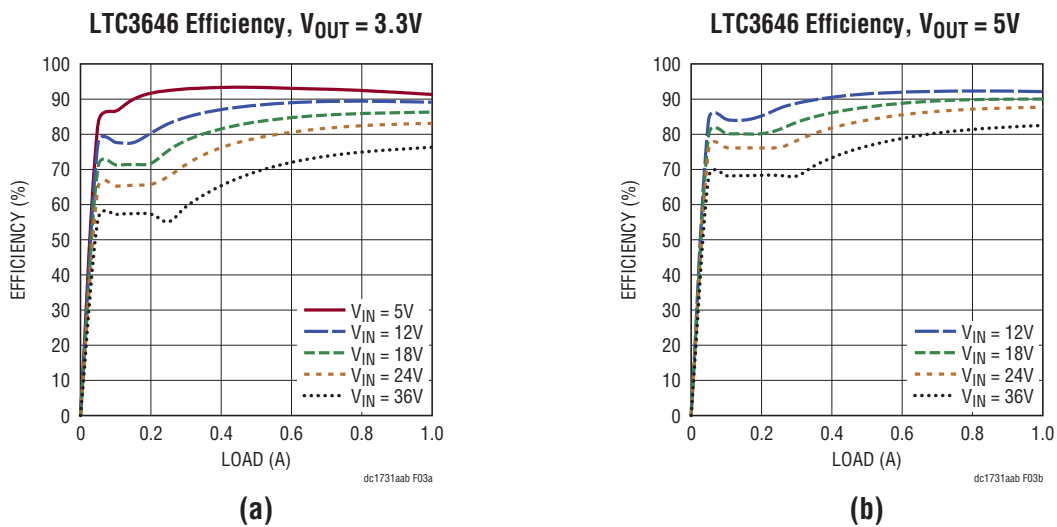


Figure 2. Measuring  $V_{IN}$  or  $V_{OUT}$  Ripple



Figures 3a and 3b. Measured DC1731A Efficiency at Different  $V_{IN}$  and  $V_{OUT}$  (Burst Mode Operation Enabled)

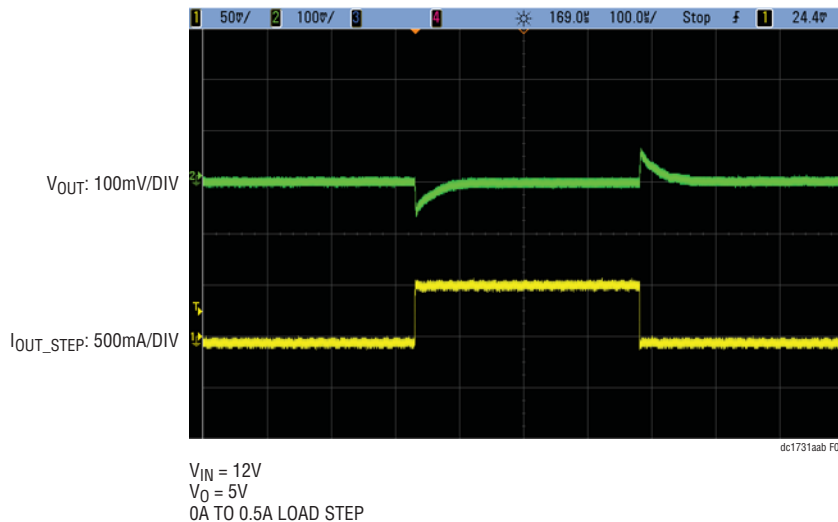


Figure 4. Measured Load Transient Responses

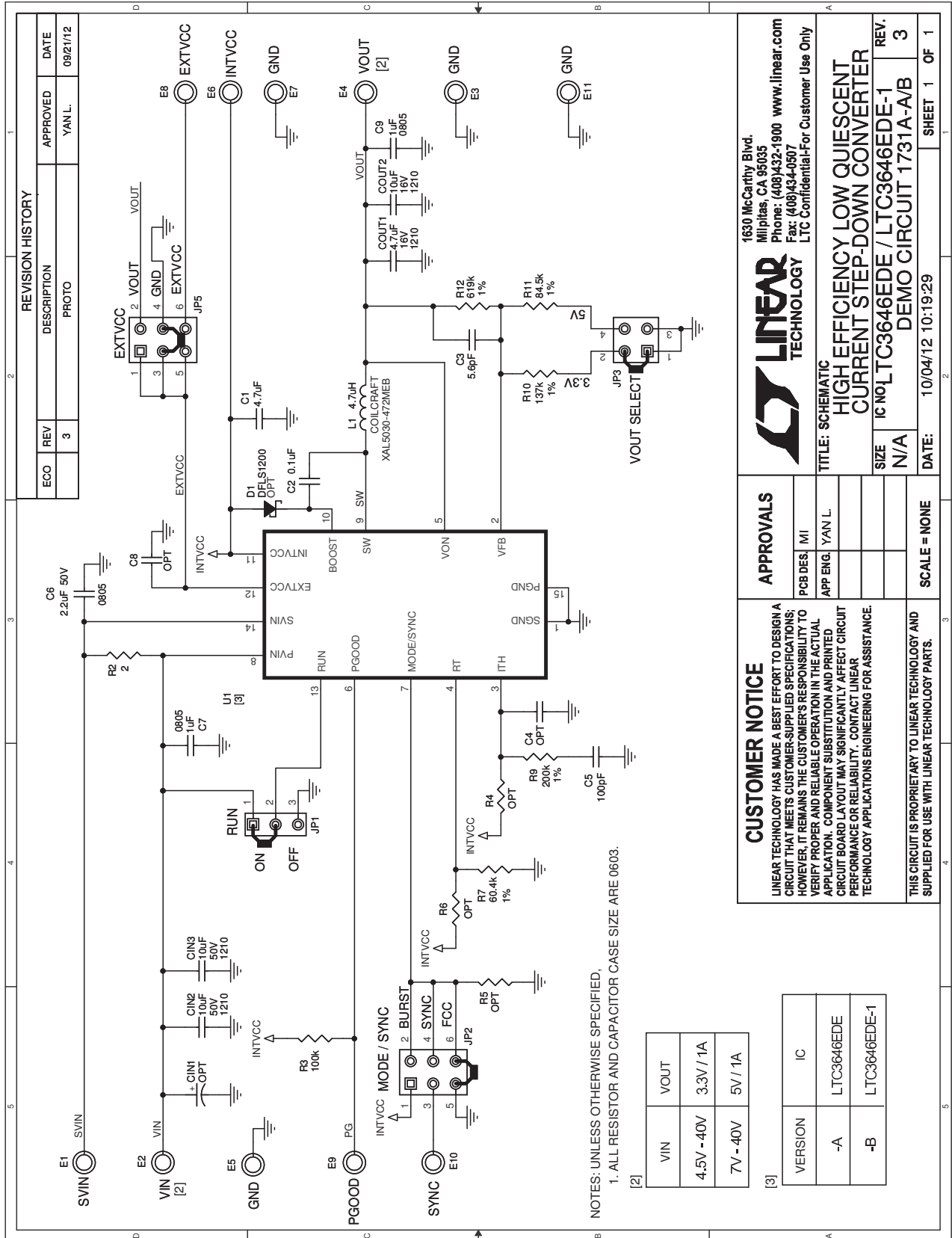
# DEMO MANUAL

## DC1731A-A/DC1731A-B

### PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	1	U1	IC, HIGH EFFICIENCY LOW QUIESCENT CURRENT STEP-DOWN CONVERTER	LTC3646EDE FOR DC1731A-A LTC3646EDE-1 FOR DC1731A-B
2	2	CIN2, CIN3	CAP, 1210 10 $\mu$ F 20% 50V X5R	TAIYO YUDEN UMK325BJ106MM-T
3	1	COUT1	CAP, 1210 4.7 $\mu$ F 20% 16V X7R	TAIYO YUDEN EMK325BJ475MN-T
4	1	COUT2	CAP, 1210 10 $\mu$ F 20% 16V X5R	TDK C3225X7R1C106M
5	1	C1	CAP, 0603 4.7 $\mu$ F 10% 10V X5R	TDK C1608X5R1A475K-T
6	1	C2	CAP, 0603 0.1 $\mu$ F 10% 50V X7R	AVX 06035C104KAT2A
7	1	C3	CAP, 0603 5.6pF 0.25pF 50V NPO	AVX 06035A5R6CAT2A
8	1	C5	CAP, 0603 100pF 10% 50V X7R	AVX 06035C101KAT2A
9	1	C6	CAP, 0805 2.2 $\mu$ F 20% 50V Y5V	TDK C2012Y5V1H225Z
10	2	C7, C9	CAP, 0805 1 $\mu$ F 10% 50V X7R	MURATA GRM21BR71H105KA12L
11	1	L1	IND, 4.7 $\mu$ H	COILCRAFT XAL5030-472MEB
12	1	R2	RES, 0603 2 $\Omega$ 5% 1/10W	VISHAY CRCW06032R00FNEA
13	1	R3	RES, 0603 100k $\Omega$ 5% 1/10W	VISHAY CRCW0603100KJNEA
14	1	R7	RES, 0603 60.4k $\Omega$ 1% 1/10W	VISHAY CRCW060360K4FKED
15	1	R9	RES, 0603 200k $\Omega$ 1% 1/10W	VISHAY CRCW0603200KFKEA
16	1	R10	RES, 0603 137k $\Omega$ 1% 1/10W	YAGEO RC0603FR-07137KL
17	1	R11	RES, 0603 84.5k $\Omega$ 1% 1/10W	VISHAY CRCW060384K5FKEA
18	1	R12	RES, 0603 619k $\Omega$ 1% 1/10W	VISHAY CRCW0603619KFKEA
<b>Additional Demo Board Circuit Components</b>				
1	0	CIN1	CAP, 56 $\mu$ F 20% 50V ALUM. ELEC. OPTION	SUN ELEC 50HVH56M OPTION
2	0	C4, C8	CAP, 0603 OPTION	OPTION
3	0	D1	DIODE, OPTION	OPTION
4	0	R4, R5, R6	RES, 0603 OPTION	OPTION
<b>Hardware: For Demo Board Only</b>				
1	11	E1-E11	TURRET	MILL-MAX 2501-2-00-80-00-00-07-0
2	1	JP1	HEADER, 2mm, 3PIN	SAMTEC TMM-103-02-L-S
3	2	JP2, JP5	HEADER, 3PIN, DBL ROW 2mm	SAMTEC TMM 103-02-L-D
4	1	JP3	HEADER, 2mm DBL ROW (2X2) 4PIN	SAMTEC TMM-102-02-L-D
5	4	MH1, MH2, MH3, MH4	STANDOFF, SNAP ON	KEYSTONE_8831
6	4	JP1, JP2, JP3, JP5	SHUNT, 2mm	SAMTEC 2SN-BK-G

### SCHEMATIC DIAGRAM



# DEMO MANUAL

## DC1731A-A/DC1731A-B

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**Please read the DEMO BOARD manual prior to handling the product.** Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

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

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