

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[®] 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 _{OUT} 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_{IN} supply to be 0V.

3. Turn on the power at the input. Increase V_{IN} 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 $\pm 2\%$.
4. 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.
5. To measure input or output ripple, please refer to Figure 2 for proper measurement setup.

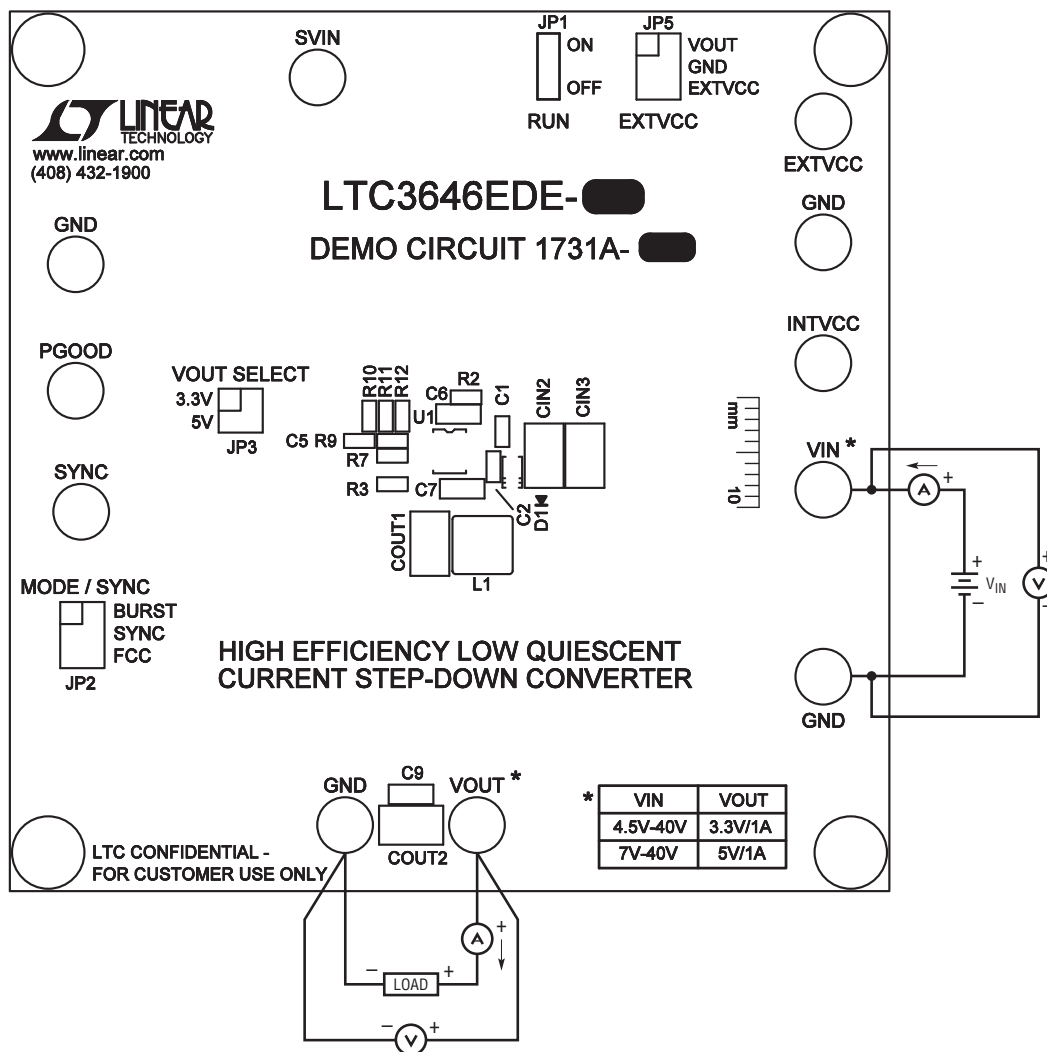


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

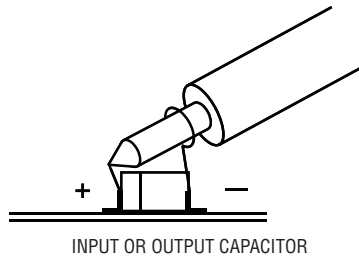
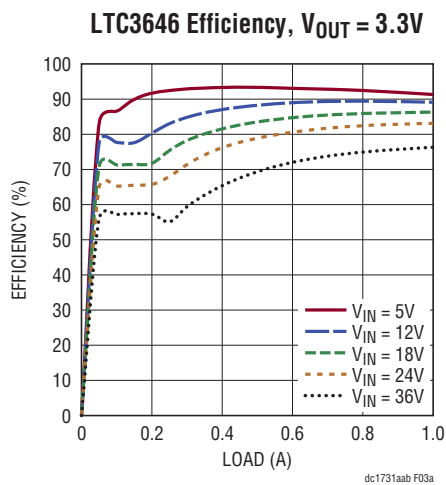
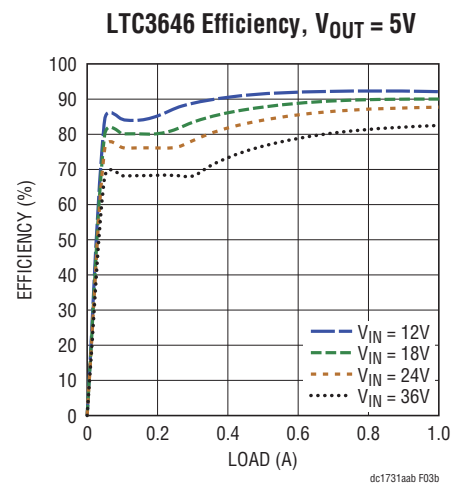


Figure 2. Measuring V_{IN} or V_{OUT} Ripple



(a)



(b)

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

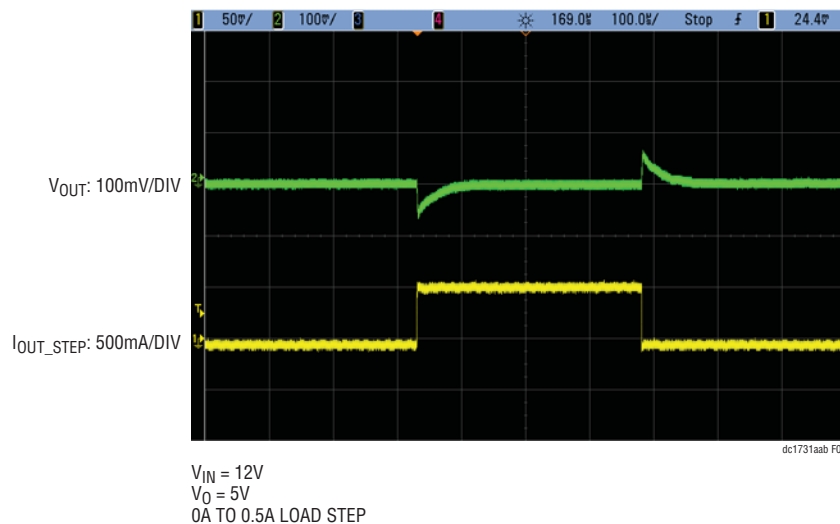


Figure 4. Measured Load Transient Responses

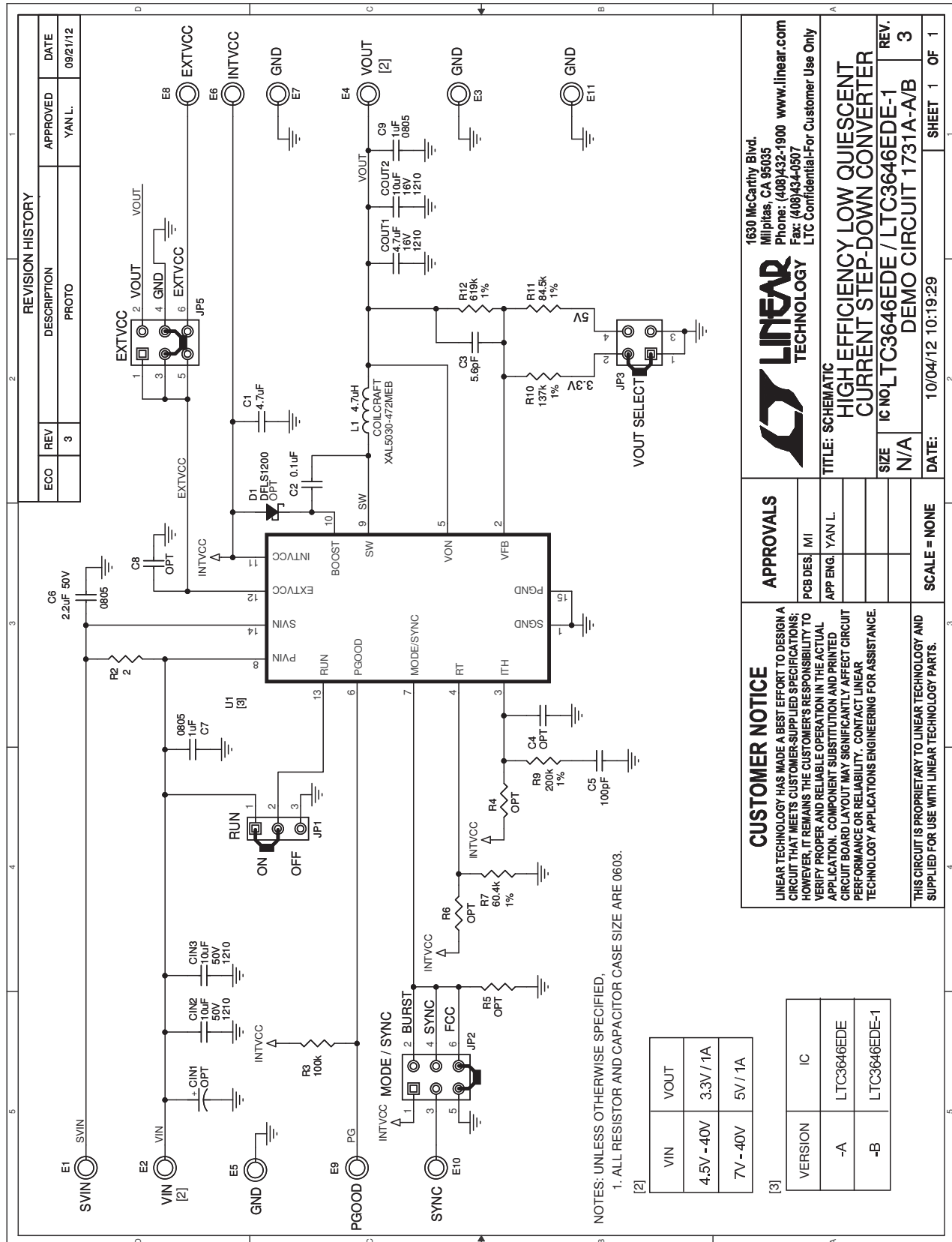
DEMO MANUAL

DC1731A-A/DC1731A-B

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
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 μ F 20% 50V X5R	TAIYO YUDEN UMK325BJ106MM-T
3	1	COUT1	CAP, 1210 4.7 μ F 20% 16V X7R	TAIYO YUDEN EMK325BJ475MN-T
4	1	COUT2	CAP, 1210 10 μ F 20% 16V X5R	TDK C3225X7R1C106M
5	1	C1	CAP, 0603 4.7 μ F 10% 10V X5R	TDK C1608X5R1A475K-T
6	1	C2	CAP, 0603 0.1 μ 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 μ F 20% 50V Y5V	TDK C2012Y5V1H225Z
10	2	C7, C9	CAP, 0805 1 μ F 10% 50V X7R	MURATA GRM21BR71H105KA12L
11	1	L1	IND, 4.7 μ H	COILCRAFT XAL5030-472MEB
12	1	R2	RES, 0603 2 Ω 5% 1/10W	VISHAY CRCW06032R00FNEA
13	1	R3	RES, 0603 100k Ω 5% 1/10W	VISHAY CRCW0603100KJNEA
14	1	R7	RES, 0603 60.4k Ω 1% 1/10W	VISHAY CRCW060360K4FKED
15	1	R9	RES, 0603 200k Ω 1% 1/10W	VISHAY CRCW0603200KFKEA
16	1	R10	RES, 0603 137k Ω 1% 1/10W	YAGEO RC0603FR-07137KL
17	1	R11	RES, 0603 84.5k Ω 1% 1/10W	VISHAY CRCW060384K5FKEA
18	1	R12	RES, 0603 619k Ω 1% 1/10W	VISHAY CRCW0603619KFKEA
Additional Demo Board Circuit Components				
1	0	CIN1	CAP, 56 μ 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
Hardware: For Demo Board Only				
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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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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