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LTC3639EMSE

High Efficiency 150V, 100mA Synchronous Buck Converter

DESCRIPTION

Demonstration circuit 1901A is a 150V input, 100mA output DC/DC power supply featuring the LTC3639. The IC operates in a high efficiency Burst Mode[®] operation and includes internal high and low side power MOSFETs. The board will accept an input voltage between 4V and 150V, and provide jumper selected output voltages of 1.8V, 3.3V, 5V and an option for additional voltages. The IC includes internal soft-start and a provision for increasing soft-start time.

Included on the board is an ON/OFF jumper that can also be configured as a precision undervoltage lockout. Additional PC pads are included for programming current limit to optimize efficiency and for reducing output voltage ripple and reducing component size. A terminal (FBO)

is included to allow multiple boards to be paralleled for higher output current.

Output voltage between 800mV and V_{IN} can be programmed using optional resistors. (Higher voltage rating output capacitors may be required.)

The LTC3639 data sheet gives a complete description of the IC operation and application information. The data sheet must be read in conjunction with this quick start guide.

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	CONDITION	VALUE
Input Voltage Range		4V to 150V
1.8V Output Voltage	$V_{IN} = 12\text{V}$, $I_{OUT} = 0\text{A}$ to 100mA	1.8V $\pm 2\%$
3.3V Output Voltage	$V_{IN} = 12\text{V}$, $I_{OUT} = 0\text{A}$ to 100mA	3.3V $\pm 2\%$
5V Output Voltage	$V_{IN} = 12\text{V}$, $I_{OUT} = 0\text{A}$ to 100mA	5V $\pm 2\%$
Maximum Output Current, I_{OUT}	$V_{IN} = 4\text{V}$ to 150V, $V_{OUT} = 1.8\text{V}$, 3.3V or 5V	100mA
Typical Efficiency	$V_{IN} = 12\text{V}$, $V_{OUT} = 5\text{V}$, $I_{OUT} = 100\text{mA}$	87.3%
Typical Output Ripple	$V_{IN} = 150\text{V}$, $V_{OUT} = 5\text{V}$, $I_{OUT} = 100\text{mA}$ (20MHz BW)	66mV _{P-P}

QUICK START PROCEDURE

Demonstration circuit 1901A is easy to set up to evaluate the performance of the LTC3639. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply (set for 0V) to V_{IN} and GND (input return).
2. Select 5V output using jumper JP1 (B position) and JP2 (A position). Select ON position for JP3.
3. Connect the 5V output load between V_{OUT} and GND (Initial load: no load).
4. Connect the DVMs to the input and outputs.
5. Turn on the input power supply and slowly increase to 12V. Check for the proper output voltages. (5V output should be within $5V \pm 2\%$.)
6. 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.

7. With power off, move jumpers JP1 and JP2 to the other fixed voltage settings (1.8V or 3.3V). Repeat steps 5 and 6. Check for the proper output voltage and other parameters.

NOTE: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 2 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (-) terminals of an output capacitor. The probe's ground ring needs to touch the (-) lead and the probe tip needs to touch the (+) lead.

ADDITIONAL NOTES:

CAUTION:

Be careful when testing with high voltage. High voltage can result in an electric shock if care is not taken.

For 5V output, V_{IN} input voltage should be at least 5V or higher.

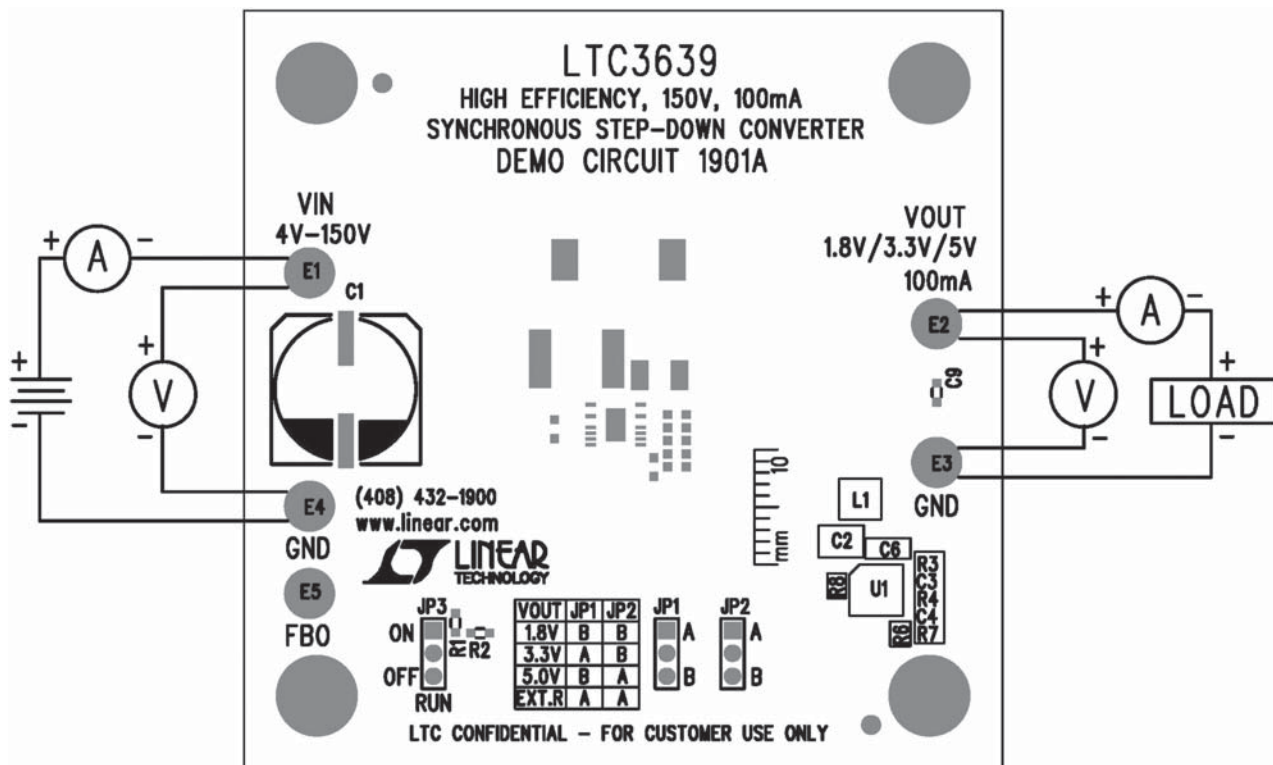


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

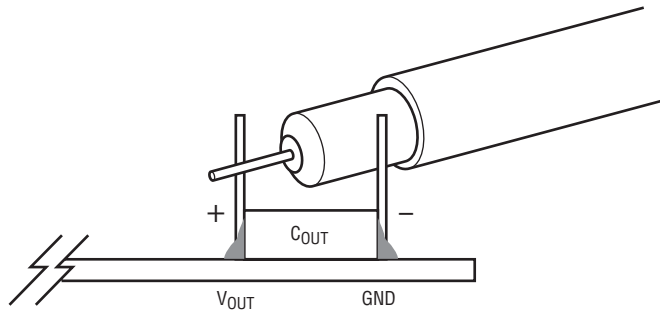


Figure 2. Measuring Output Voltage Ripple

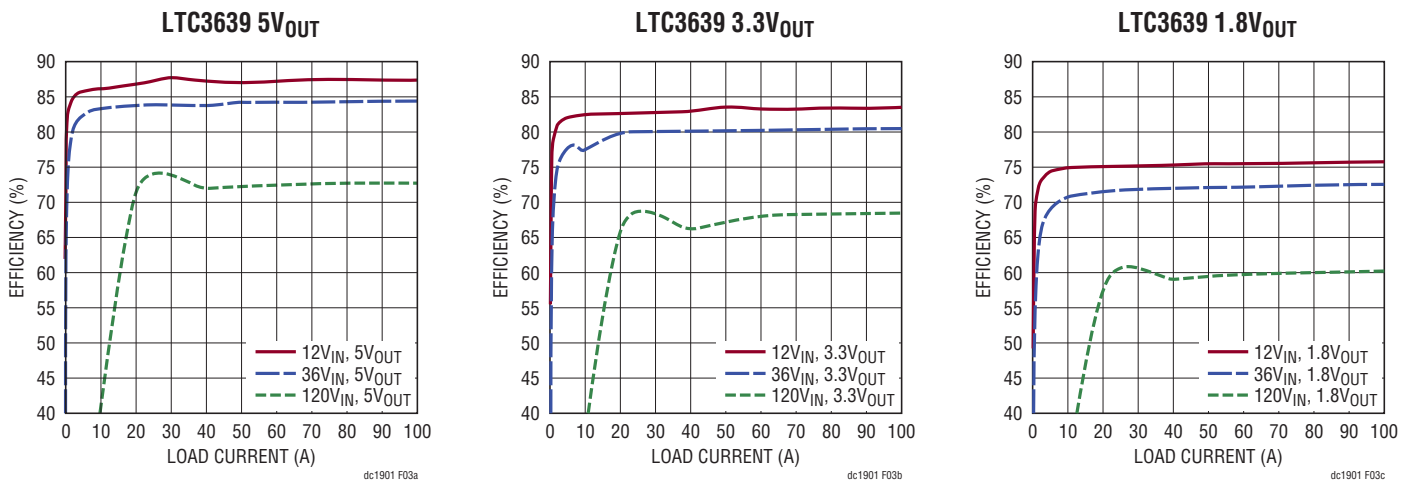


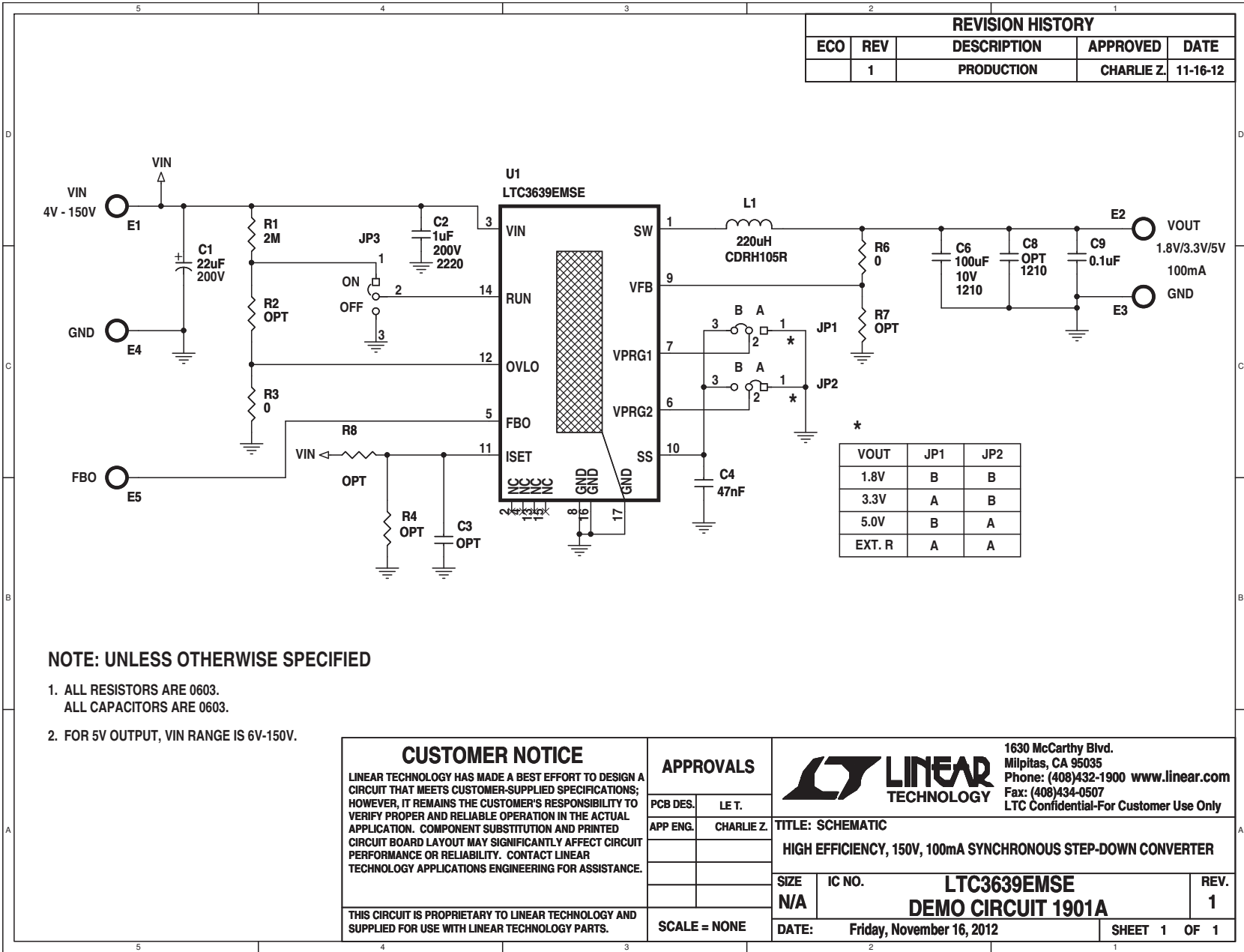
Figure 3. Efficiency vs Load Current

DEMO MANUAL DC1901A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	ALUM. ELECT 22 μ F 200V MVE Series 12.5x16mm	NIPPON CHEMI-CON, EMVE201ARA220MKG5S
2	1	C2	CAP., X7R, 1 μ F, 200V, 10% 2220	KEMET, C2220X105K2RAC7533
3	1	C4	CAP., X7R, 47nF, 25V, 10% 0603 0.047 μ F	AVX, 06033C473KAT2A
4	1	C6	CAP., X7R, 100 μ F, 10V, 20% 1210	TAIYO YUDEN, LMK325ABJ107MM-T
5	1	C9	CAP., X7R, 0.1 μ F, 25V, 10% 0603	AVX, 06033C104KAT2A
6	1	L1	INDUCTOR, 220 μ H	SUMIDA, CDRH105RNP-221NC
7	1	R1	RES., CHIP, 2M, 1/10W, 5% 0603	VISHAY, CRCW06032M00JNEA
8	2	R3, R6	RES., CHIP, 0 Ω , 1/10W, 0603	VISHAY, CRCW06030000Z0EA
9	1	U1	IC., LTC3639EMSE MSE16(12), 4X3MM	LINEAR TECH., LTC3639EMSE#PBF
Additional Demo Board Circuit Components				
10	0	C3	CAP., 0603	OPT
11	0	C8	CAP., 1210	OPT
12	0	R2, R4, R7, R8	RES., 0603	OPT
Hardware: For Demo Board Only				
13	5	E1, E2, E3, E4, E5	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
14	3	JP1, JP2, JP3	HEADER, 3 PIN 0.079" SINGLE ROW	SULLINS, NRPNO31PAEN-RC
15	3	XJP1, XJP2, XJP3	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G

REVISION HISTORY				
ECO	REV	DESCRIPTION	APPROVED	DATE
	1	PRODUCTION	CHARLIE Z.	11-16-12



NOTE: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 0603.
ALL CAPACITORS ARE 0603.
2. FOR 5V OUTPUT, VIN RANGE IS 6V-150V.

<p align="center">CUSTOMER NOTICE</p> <p>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.</p> <p>THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.</p>	<p align="center">APPROVALS</p> <table border="1"> <tr> <td>PCB DES.</td> <td>LE T.</td> </tr> <tr> <td>APP ENG.</td> <td>CHARLIE Z.</td> </tr> </table>	PCB DES.	LE T.	APP ENG.	CHARLIE Z.		<p>1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408)432-1900 www.linear.com Fax: (408)434-0507 LTC Confidential-For Customer Use Only</p>					
	PCB DES.	LE T.										
APP ENG.	CHARLIE Z.											
<p>TITLE: SCHEMATIC</p> <p align="center">HIGH EFFICIENCY, 150V, 100mA SYNCHRONOUS STEP-DOWN CONVERTER</p>												
<p>SCALE = NONE</p>		<table border="1"> <tr> <td>SIZE</td> <td>IC NO.</td> <td>REV.</td> </tr> <tr> <td>N/A</td> <td align="center">LTC3639EMSE</td> <td align="center">1</td> </tr> <tr> <td align="center" colspan="2">DEMO CIRCUIT 1901A</td> <td></td> </tr> </table>	SIZE	IC NO.	REV.	N/A	LTC3639EMSE	1	DEMO CIRCUIT 1901A			<p>DATE: Friday, November 16, 2012</p>
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N/A	LTC3639EMSE	1										
DEMO CIRCUIT 1901A												
			SHEET 1 OF 1									

DEMO MANUAL DC1901A

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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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