DEMO MANUAL DC2119A

LTC3115EDHD-2
40V, 2A Synchronous Buck-Boost DC/DC Converter

DESCRIPTION

Demonstration circuit 2119A features the LTC®3115-2, a high voltage monolithic synchronous buck-boost converter optimized for applications with fast input voltage transients.

The DC2119A demo board has two user selectable operating modes: Burst Mode© and Forced Continuous Operation (Fixed Frequency PWM) (JP1). There is also an accurate programmable RUN pin which is used to ENABLE the converter (JP2).

The DC2119A operates with a 2.7V to 40V input voltage range. The demo board has been designed with the output voltage set to 5.0V. The LTC3115-2 incorporates a proprietary low noise switching algorithm which optimizes efficiency with input voltages above, below or equal to the output voltage and ensures seamless transitions between operating modes.

The demo board has been programmed to operate at 750kHz in PWM mode to optimize small size with high efficiency operation.

The demo board also has optional provisions to back-feed V_{CC} in order to increase efficiency in some 5V output applications. There is also a provision for an optional Schottky diode from SW2 to V_{OUT} for applications where V_{OUT} is greater than 20V and short-circuit protection is desired. Consult the data sheet for more information on these options.

Figures 1 and 2 show typical demo board efficiency. Figure 3 shows the response to an input voltage step.

The LTC3115-2 data sheet has detailed information about the operation, specifications, and applications of the part. The data sheet should be read in conjunction with this Quick Start Guide.

Design files for this circuit board are available at http://www.linear.com/demo/DC2119A

PERFORMANCE SUMMARY

Input Voltage Range	2.7V to 40V
V_{OUT}	5.0V
I_{OUT} (see Note 1)	0.8A for V_{IN} > 3.6V, 2A for V_{IN} > 6V
Efficiency	See Figures 1 & 2

NOTE 1: The demo board output current is a function of V_{IN}. Please refer to the data sheet for more information.

QUICK START PROCEDURE

Using short twisted pair leads for any power connections and with all loads and power supplies off, refer to Figure 4 for the proper measurement and equipment setup. The Battery/Power Supply (PS1) should not be connected to the circuit until told to do so in the procedure below.

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 V_{IN} or V_{OUT} and GND terminals (see Figure 5), or by using an oscilloscope probe tip jack.

1. Jumper and PS1 settings to start:

   PS1 = OFF

   JP1 (PWM) = FIXED FREQUENCY

   JP2 (RUN) = ON

2. With power OFF connect the power supply (PS1) as shown in Figure 4. If accurate current measurements are desired (for efficiency calculation for example) then connect an ammeter in series with the supply as shown. The ammeter is not required however.
3. Connect a 500mA load to V_{OUT} as shown in Figure 2 (10Ω for V_{OUT} = 5V). Connect an ammeter if accurate current measurement or monitoring is desired.
4. Turn on PS1 and slowly increase voltage until the voltage at V_{IN} is 4.0V.
5. Verify V_{OUT} is ~5.0V.
6. V_{IN} can now be varied between 2.7V and 40.0V. V_{OUT} should remain in regulation.
7. Load current (I_{OUT}) can also be varied. The maximum I_{OUT} is a function of V_{IN} and the current limit. Consult the datasheet for more information on I_{OUT} vs V_{IN}. In general for V_{IN} > 3.6V I_{OUT} can be increased to 0.8A. For V_{IN} > 6V I_{OUT} can be increased to 2A.
8. For operation in Burst Mode move Jumper JP1 to BURST. I_{OUT} is limited in Burst Mode. See the data sheet for more information.
9. NOTE: If V_{OUT} drops out of regulation, check to be sure the maximum load has not been exceeded, or that V_{IN} is not below the minimum value for regulation (see data sheet)

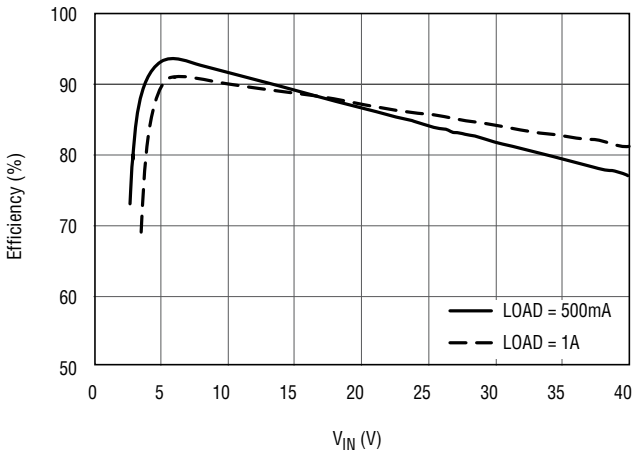


Figure 1. DC2119A Efficiency in PWM Mode

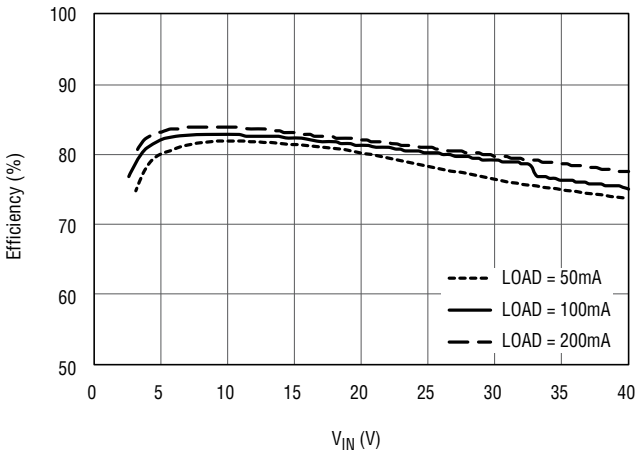


Figure 2. DC2119A Efficiency in Burst Mode

QUICK START PROCEDURE

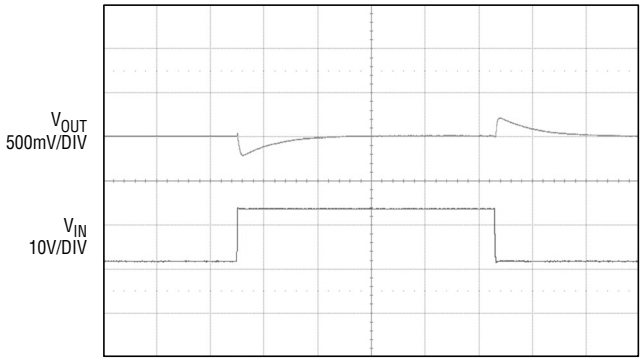


Figure 3. DC2119A Step Input Response

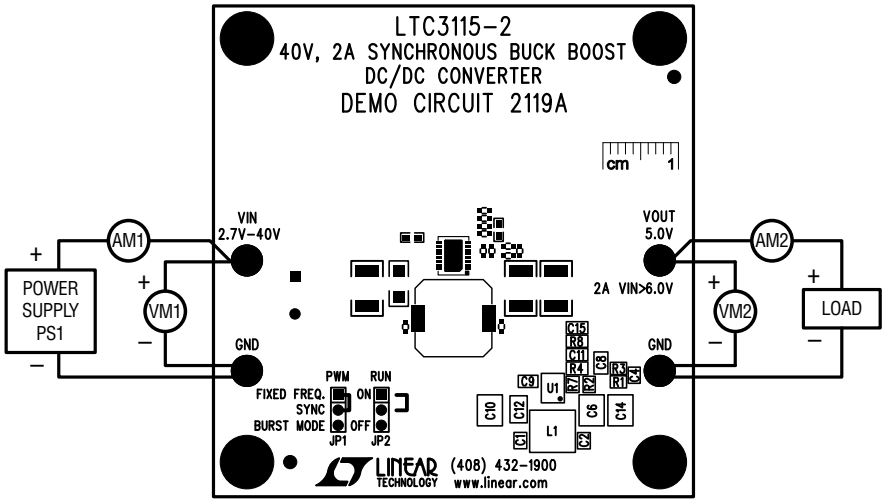


Figure 4. Proper Measurement Equipment Setup

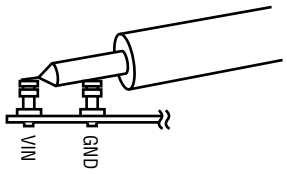
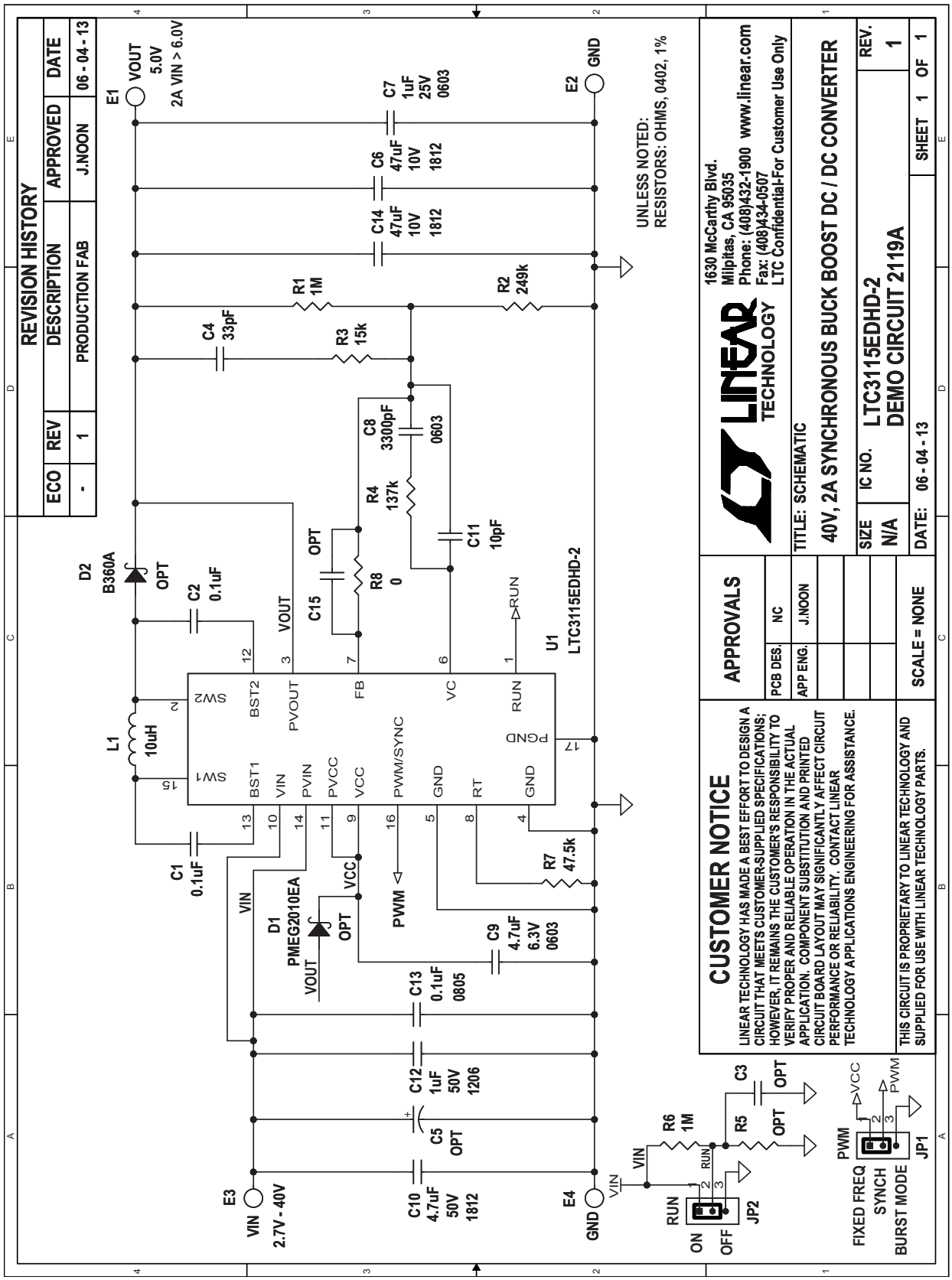


Figure 5. Measuring Input or Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C2	CAP CER 0.10µF, 16V, X7R, ±20%, 0402	TDK, C1005X7R1C104M
2	1	C4	CAP CER, 33pF, 50V, C0G, 5%, 0402	TDK, C1005C0G1H330J
3	2	C6, C14	CAP CER, 47µF, 10V, 20%, X5R, 1812	TDK, C4532X5R1A476M
4	1	C7	CAP CER, 1.0µF, 25V, X5R, 0603	TDK, C1608X5R1E105M
5	1	C8	CAP CER, 3300pF, 50V, 5%, NP0, 0603	TDK, C1608C0G1H332J
6	1	C9	CAP CER, 4.7µF, 6.3V, X5R, 20%, 0603	TDK, C1608X5R0J475M
7	1	C10	CAP CER, 4.7µF, 50V, 20%, X7R, 1812	TDK, C4532X7R1H475M/2.00
8	1	C11	CAP CER, 10pF, 50V, C0G, 0402	TDK, C1005C0G1H100D
9	1	C12	CAP CER, 1.0µF, 50V, X7R, 20%, 1206	TDK, C3216X7R1H105M
10	1	C13	CAP CER, 0.1µF, 50V, 20%, X7R, 0805	TDK, C2012X7R1H104M/0.85
11	1	L1	INDUCTOR, 10µH, ±20%	COILCRAFT, MSS1048-103MLB
12	2	R1, R6	RES, 1.00MΩ, 1/16W, 1%, 0402, SMD	VISHAY, CRCW04021M00FKED
13	1	R2	RES, 249kΩ, 1/16W, 1%, 0402, SMD	VISHAY, CRCW0402249KFKED
14	1	R3	RES, 15.0kΩ, 1/10W, 1%, 0402, SMD	PANASONIC, ERJ-2RKF1502X
15	1	R4	RES 137KΩ, 1/10W, 1%, 0402, SMD	PANASONIC, ERJ-2RKF1373X
16	1	R7	RES, 47.5kΩ, 1/16W, 1%, 0402, SMD	VISHAY, CRCW040247K5FKED
17		R8	RES 0.0Ω, 1/10W, JUMP 0402 SMD	PANASONIC, ERJ-2GE0R00X
18	1	U1	40V, 2A BUCK BOOST DC/DC CONVERTER	LINEAR TECHNOLOGY, LTC3115EDHD-2
Additional Demo Board Circuit Components				
1	0	C3, C15	0402 (OPT)	
2	0	C5	CAP ALUM 150µF, 50V, 20%, RADIAL (OPT)	PANASONIC, EEU-FM1H151
3	0	D1	DIODE SCHOTTKY, 20V, 1A, SOD323 (OPT)	NXP SEMI, PMEG2010EA
4	0	D2	DIODE SCHOTTKY 60V, 3A, SMA (OPT)	DIODES INC.,B360A-13
5	0	R5	RES, 0402 (OPT)	
Hardware: For Demo Board Only				
1	4	E1-E4	TP, TURRET, 0.094", PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
2	2	JP1, JP2	JMP, 3-PIN, 1 ROW .079CC	SAMTEC, TMM-103-02-L-S
3	2	XJP1, XJP2	SHUNT, .079" CENTER	SAMTEC, 2SN-BK-G
4	4		SPACER STACKING #4 SCREW NYLON .500"	KEYSTONE, 8833

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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