LTC3119UFD
18V, 5A Synchronous Buck-Boost DC/DC Converter

DESCRIPTION

Demonstration circuit 2129A features the LTC®3119, an 18V, 5A synchronous buck/boost DC/DC converter. The DC2129A has been designed for an input voltage range of 2.5V to 18V with an output voltage (V_{OUT}) set to 5V. For V_{IN} > 5V the output current can be as high as 5A. The unique 4-switch, single inductor architecture provides low noise and seamless operation from input voltages above, below, or equal to the output voltage.

The LTC3119 features selectable PWM or Burst Mode® operation, and an easily synchronizable oscillator. A jumper JP3, is provided to select the operating mode. A clock signal can also be applied to JP3 if synchronization is desired. The demo board is configured for a switching frequency of 750kHz. Jumper JP1 is provided to enable the converter. Resistors R8 and R9 can be used to set an accurate turn-on voltage of the converter.

Typical demo board efficiency is shown in Figure 1 for several input voltages as a function of load current. Consult the data sheet for more information. The transient response of the converter is shown in Figure 2 and Figure 3. The converter is built on a four layer board using 2oz copper on each layer for better thermal performance. The spacing between the layers has been reduced so the overall board thickness is 0.031 inches allowing for better heat transfer between layers and aiding in heat distribution across the board. The thermal performance of the demo board is shown in Figure 4. The converter can also operate in a maximum power point control mode by setting the JP2 jumper to the ON position. The MPPC point can be adjusted by changing R10 and R11. Consult the data sheet for more information.

The LTC3119 data sheet has detailed information about the operation, specifications, and applications of the device. 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/DC2129A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

Input Voltage Range	2.5V to 18V
V_{OUT}	5V
I_{OUT}	5A for V_{IN} > 5V
Efficiency	See Figure 1

Note: Demo board output current is a function of input voltage. 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 5 for the proper measurement and equipment setup. The power supply 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.

1. JP1, JP2, JP3, and load settings to start:
   JP1 (RUN) = OFF
   JP2 (MPPC) = OFF
   JP3 (PWM) = FIXED FREQUENCY
   LOAD = NO LOAD

2. With power OFF connect the power supply as shown in Figure 5. If accurate current measurements are desired (for efficiency calculations for example) then connect an ammeter in series with the supply as shown. The ammeter is not required however.

3. Connect the load to V_{OUT} as shown in Figure 5. Again, connect an ammeter if accurate current measurement or monitoring is desired.

4. Move jumper JP1 to ON. Turn on the power supply and slowly increase voltage until the voltage at V_{IN} is 2.5V.

5. Verify V_{OUT} is ~5V.

6. V_{IN} can now be varied between 2.5V and 18V. V_{OUT} should remain in regulation.

7. I_{OUT} can also be varied from 0A to 5A. For V_{IN} < 5V, maximum I_{OUT} is reduced. This reduction is due to I_{IN} increasing as V_{IN} decreases. Once the input current limit is reached, V_{OUT} will drop out of regulation.

   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 (2.5V).

8. For operation in Burst Mode move jumper JP3 to BURST MODE. I_{OUT} is limited in Burst Mode operation. See the data sheet for more information.

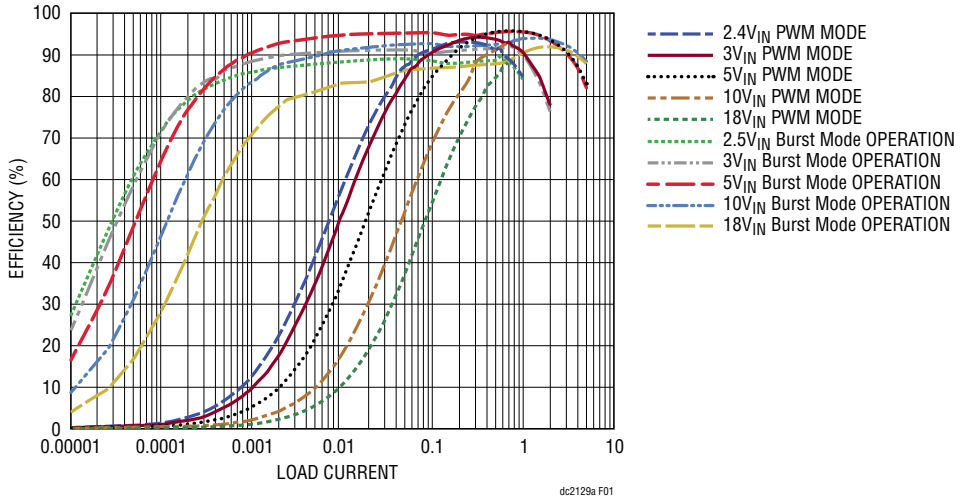


Figure 1. Typical Efficiency as a Function of Input Voltage and Load Current

QUICK START PROCEDURE

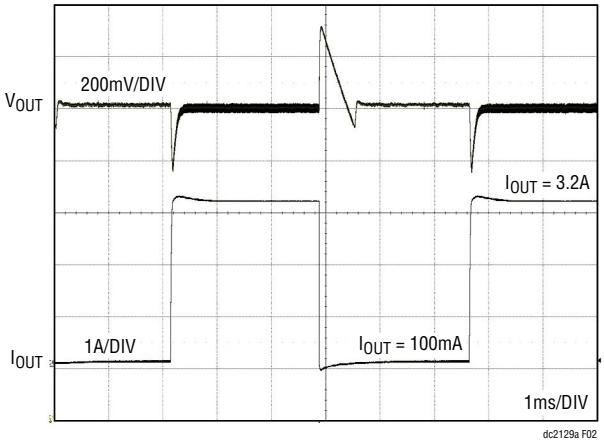


Figure 2. Typical Load Transient Response for a 100mA to 3.2A Transient Load for V_{IN} = 3.5V

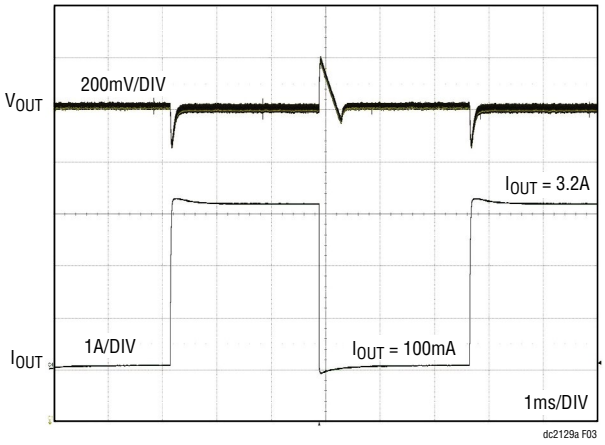


Figure 3. Typical Load Transient Response for a 100mA to 3.2A Transient Load for V_{IN} = 18V

QUICK START PROCEDURE

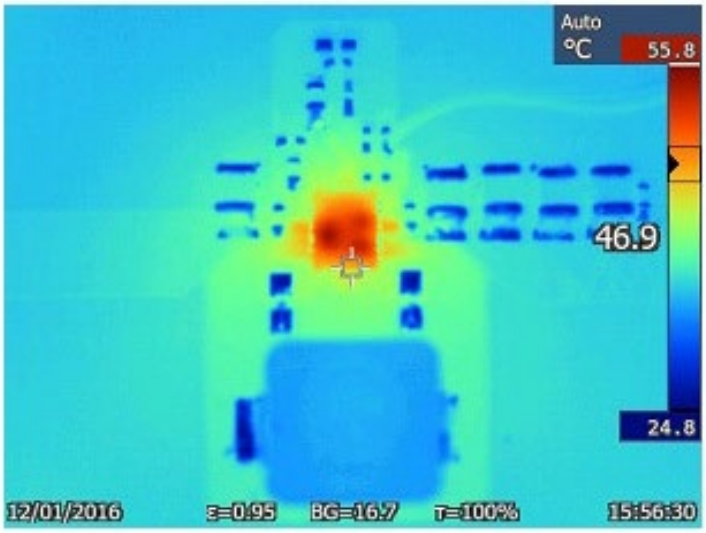


Figure 4. Thermal Image for a 3.6V Input Converter Delivering 5V at 3A

QUICK START PROCEDURE

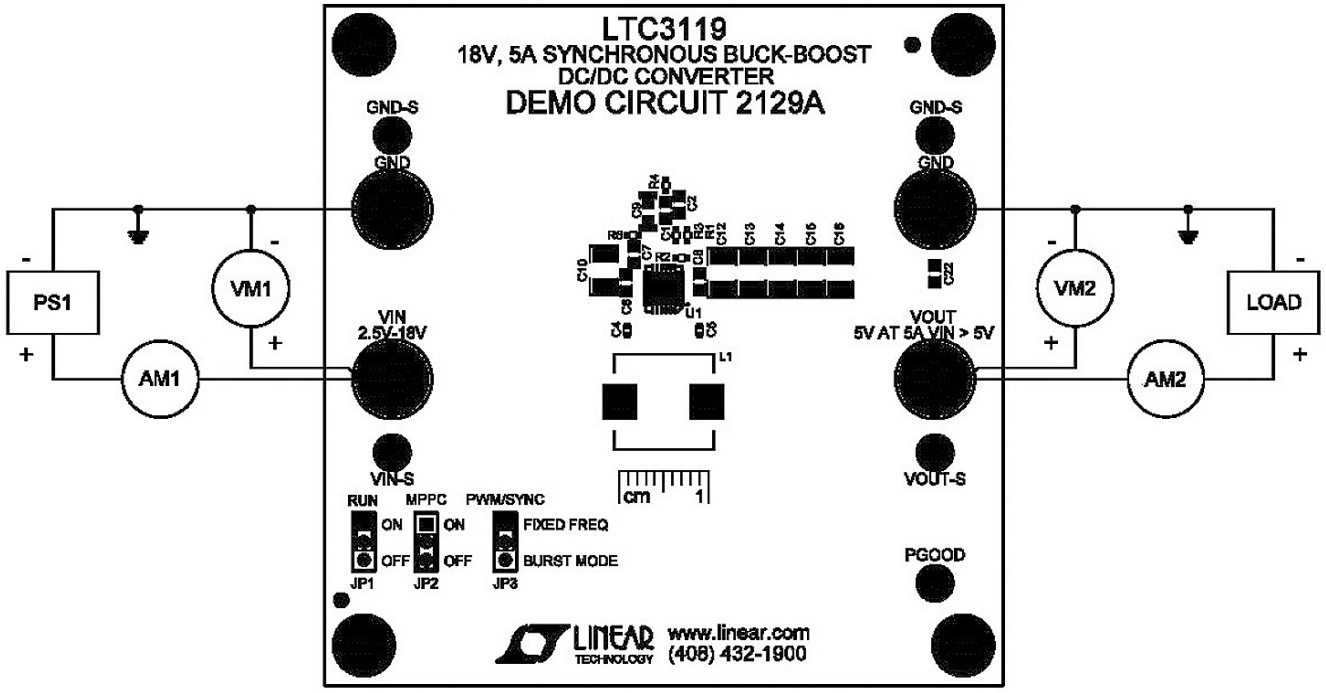
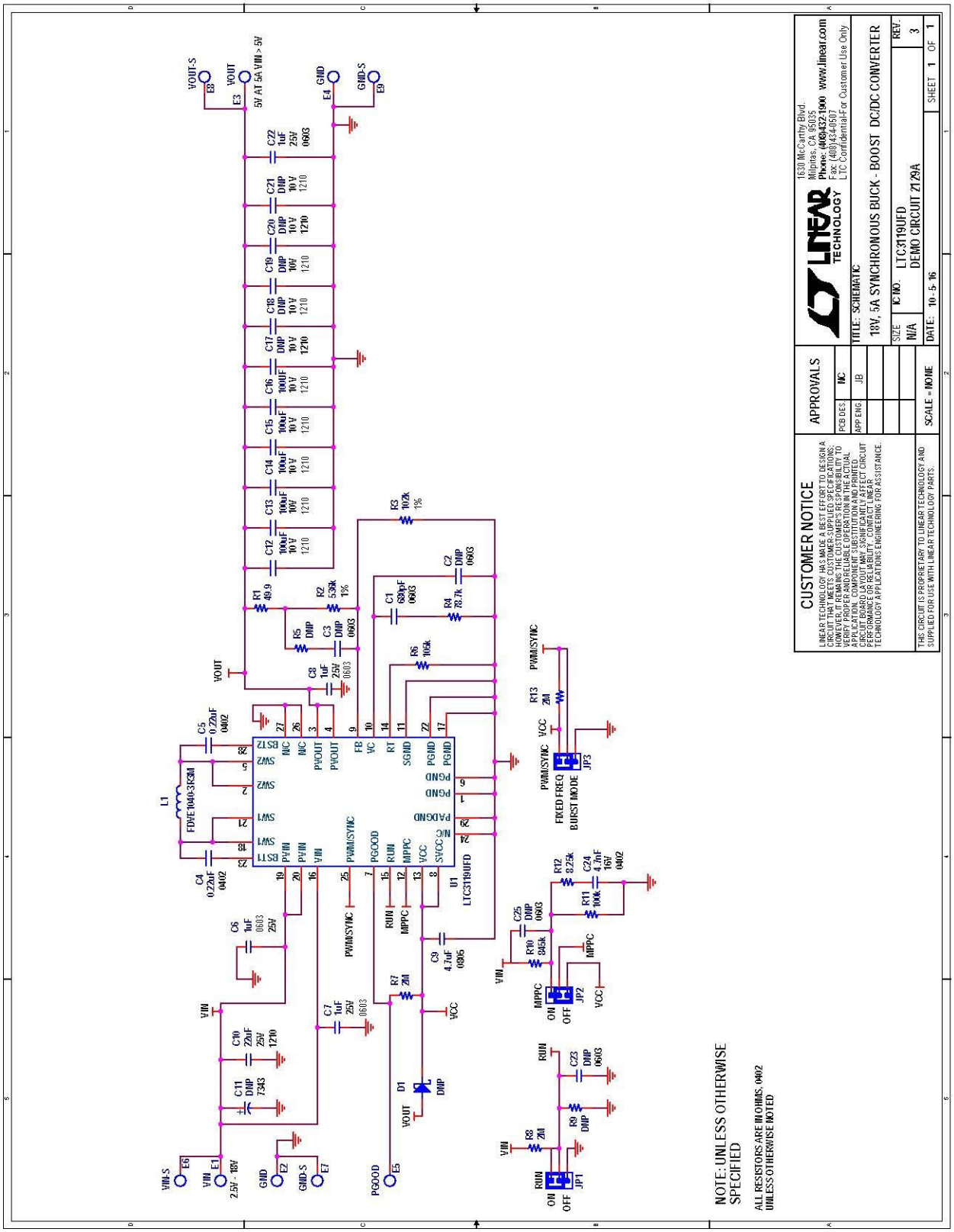


Figure 5. Measurement Setup

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP CER 680pF 50V 5% C0G 0603	TDK CGA3E2C0G1H681J
2	2	C4, C5	CAP CER 0.22µF 10V X7R 0402	TDK C1005X7R1A224M050BB
3	4	C6, C7, C8, C22	CAP CER 1µF 25V X5R 0603	TDK C1608X5R1E105M
4	1	C9	CAP CER 4.7µF 6.3V 10% X7R 0805	TDK CGJ4J2X7R0J475K125AA
5	1	C10	CAP CER 22µF 25V X5R 20% 1210	TDK C3225X5R1E226M
6	5	C12 TO C16	CAP CER 100µF 10V X5R 20% 1210	MURATA GRM32ER61A107ME20L
7	1	C24	CAP CER 4700pF 16V X7R 0402	TDK CGJ2B2X7R1C472K050BA
8	1	L1	INDUCTOR, 3R3µH	TOKO FDVE1040-H-3R3M
9	1	R1	RES 49.9Ω 1/16W 1% 0402 SMD	VISHAY CRCW040249R9FKED
10	1	R2	RES 536kΩ 1/16W 1% 0402 SMD	VISHAY CRCW0402536KFKED
11	1	R3	RES 102kΩ 1/16W 1% 0402 SMD	VISHAY CRCW0402102KFKED
12	1	R4	RES 78.7kΩ 1/16W 1% 0402 SMD	VISHAY CRCW040278K7FKED
13	1	R6	RES 105kΩ 1/16W 1% 0402 SMD	VISHAY CRCW0402105KFKED
14	3	R7, R8, R13	RES 2MΩ 1/16W 1% 0402 SMD	VISHAY CRCW04022M00FKED
15	1	R10	RES 845kΩ 1/16W 1% 0402 SMD	VISHAY CRCW0402845KFKED
16	1	R11	RES 100kΩ 1/16W 1% 0402 SMD	VISHAY CRCW0402100KFKED
17	1	R12	RES 8.25kΩ 1/16W 1% 0402 SMD	VISHAY CRCW04028K25FKED
18	1	U1	18V, 5A SYNCHRONOUS BUCK-BOOST DC/DC CONVERTER	LINEAR TECHNOLOGY LTC3119EUFD#PBF
Additional Demo Board Circuit Components				
19	0	C2, C3, C23, C25 (DNP)	CAP CER 0603	
20	0	C11 (DNP)	CAP TANT 68µF 20V 10% SMD 7343	
21	0	C17 TO C21 (DNP)	CAP CER 100µF 10V X5R 20% 1210	MURATA GRM32ER61A107ME20L
22	0	D1 (DNP)	DIODE SCHOTTKY, DFN1006-2	
23	0	R5, R9 (DNP)	RES CHIP 0402	
Hardware: For Demo Board Only				
24	4	E1 TO E4	JACK BANANA	KEYSTONE575-4
25	5	E5 TO E9	TURRET, 0.09 DIA	2501-1-00-80-00-00-07-0
26	3	JP1 TO JP3	JMP, 3PIN 1 ROW 0.079CC	WURTH ELEKTRONIK 62000311121
27	3	XJP1 TO XJP3	SHUNT, 0.079˝ CENTER	WURTH ELEKTRONIK 60800213421
28	4	MH1 TO MH4	STAND-OFF, NYLON 0.375˝ TALL	WURTH ELEKTRONIK 702933000

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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