

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>

LT, LT, LTC, LTM, Linear Technology, Burst Mode and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

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

| | |
|---------------------|----------------------|
| 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.

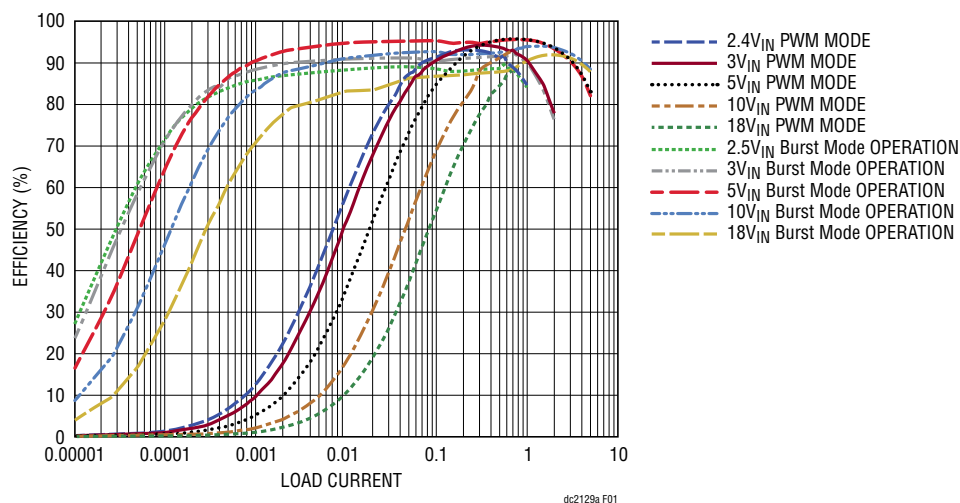


Figure 1. Typical Efficiency as a Function of Input Voltage and Load Current

QUICK START PROCEDURE

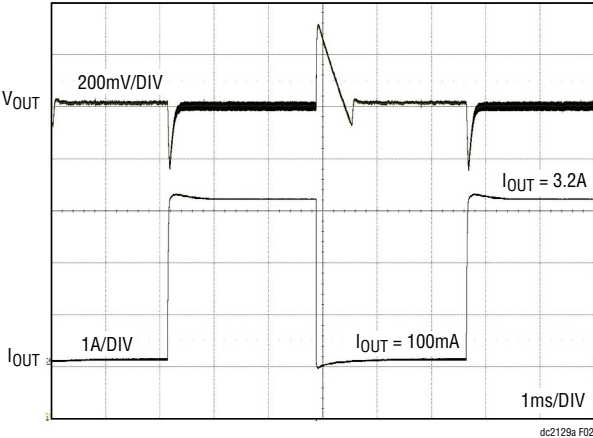


Figure 2. Typical Load Transient Response for a 100mA to 3.2A Transient Load for $V_{IN} = 3.5V$

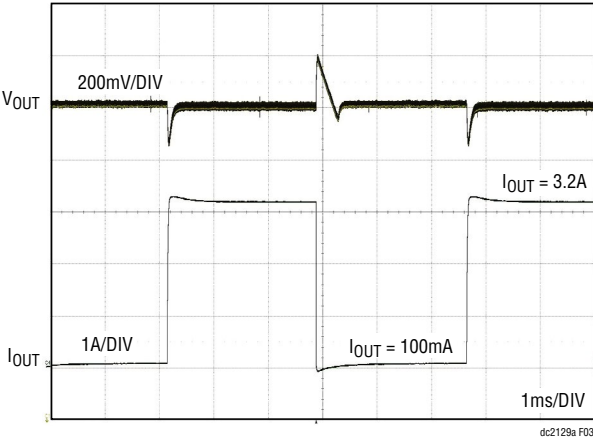


Figure 3. Typical Load Transient Response for a 100mA to 3.2A Transient Load for $V_{IN} = 18V$

QUICK START PROCEDURE



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

QUICK START PROCEDURE

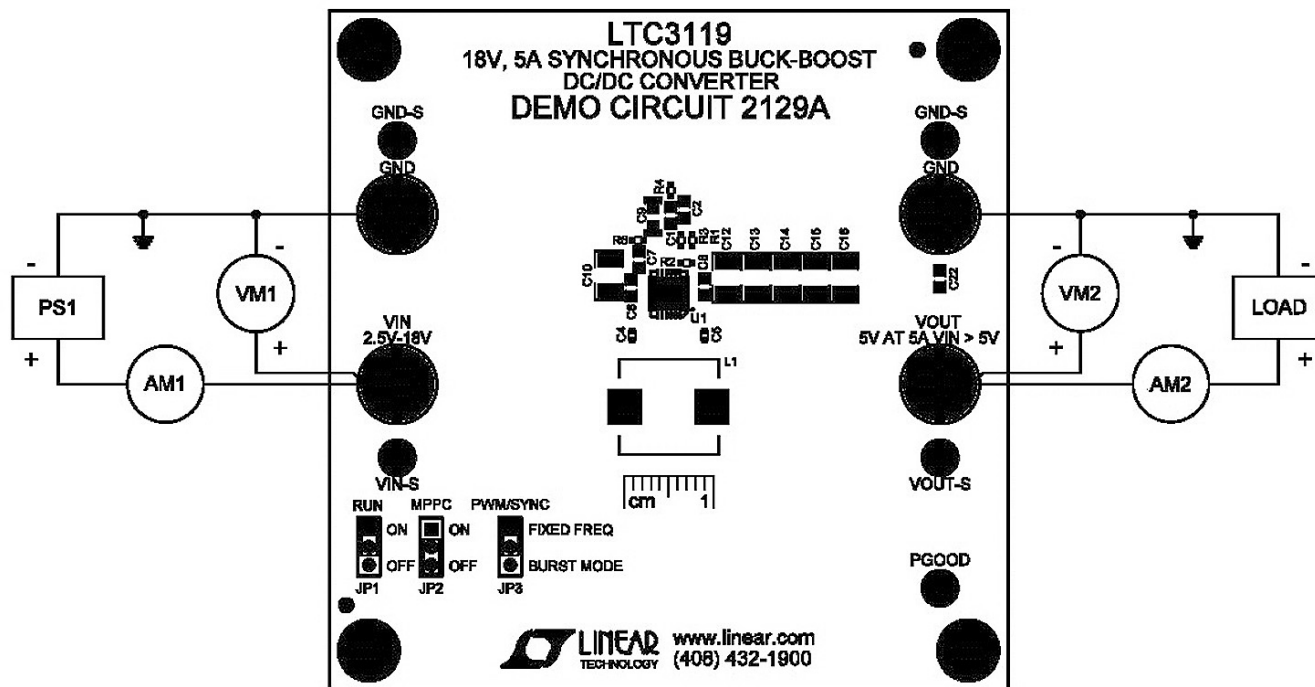


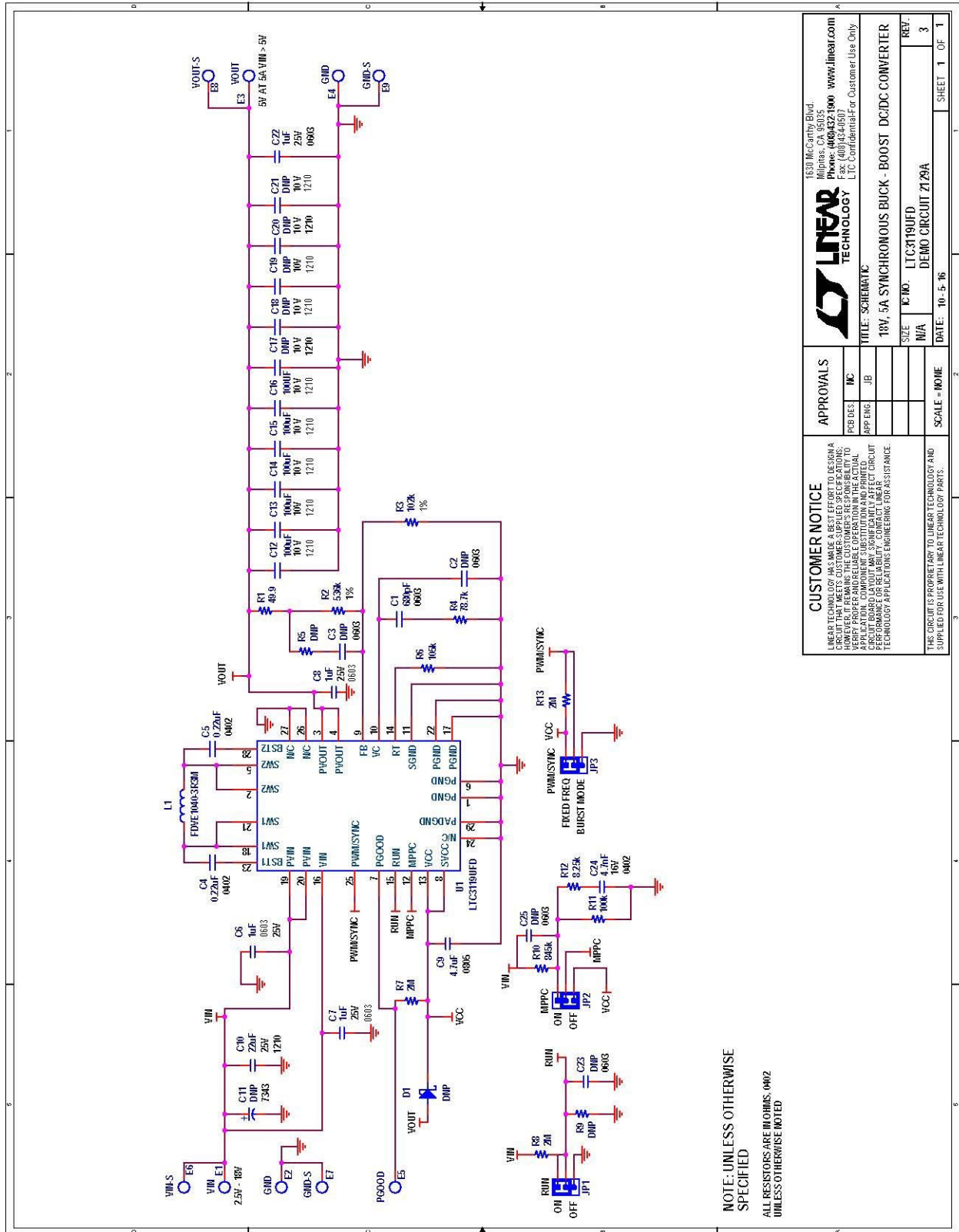
Figure 5. Measurement Setup

DEMO MANUAL DC2129A

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 LTC3119EUFDPBF |
| 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



| | |
|--|--------------------|
| <p>16300 McCarty Blvd. Millsis, MA 01864 Phone: (408) 321-1000 www.linear.com Fax: (408) 434-4507 LTC Confidential For Customer Use Only</p> | |
| <p>LINEAR TECHNOLOGY</p> | |
| <p>TITLE: SCHEMATIC</p> | |
| <p>18V, 5A SYNCHRONOUS BUCK-BOOST DC/DC CONVERTER</p> | |
| SIZE | IC NO. |
| N/A | LTC3191FDC |
| SCALE | DEMO CIRCUIT Z129A |
| DATE: 10-5-16 | |
| SHEET 1 OF 1 | |

CUSTOMER NOTICE
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS. HOWEVER, PERFORMANCE DEPENDS ON THE QUALITY OF THE COMPONENTS AND THE APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD MANUFACTURING VARIATIONS CAN AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

DEMO MANUAL DC2129A

DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

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.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [Power Management IC Development Tools](#) category:

Click to view products by [Analog Devices](#) manufacturer:

Other Similar products are found below :

[EVAL-ADM1168LQEBZ](#) [EVB-EP5348UI](#) [MIC23451-AAAYFL EV](#) [MIC5281YMME EV](#) [DA9063-EVAL](#) [ADP122-3.3-EVALZ](#) [ADP130-0.8-EVALZ](#) [ADP130-1.2-EVALZ](#) [ADP130-1.5-EVALZ](#) [ADP130-1.8-EVALZ](#) [ADP1714-3.3-EVALZ](#) [ADP1716-2.5-EVALZ](#) [ADP1740-1.5-EVALZ](#) [ADP1752-1.5-EVALZ](#) [ADP1828LC-EVALZ](#) [ADP1870-0.3-EVALZ](#) [ADP1871-0.6-EVALZ](#) [ADP1873-0.6-EVALZ](#) [ADP1874-0.3-EVALZ](#) [ADP1882-1.0-EVALZ](#) [ADP199CB-EVALZ](#) [ADP2102-1.25-EVALZ](#) [ADP2102-1.875EVALZ](#) [ADP2102-1.8-EVALZ](#) [ADP2102-2-EVALZ](#) [ADP2102-3-EVALZ](#) [ADP2102-4-EVALZ](#) [ADP2106-1.8-EVALZ](#) [ADP2147CB-110EVALZ](#) [AS3606-DB](#) [BQ24010EVM](#) [BQ24075TEVM](#) [BQ24155EVM](#) [BQ24157EVM-697](#) [BQ24160EVM-742](#) [BQ24296MEVM-655](#) [BQ25010EVM](#) [BQ3055EVM](#) [NCV891330PD50GEVB](#) [ISLUSBI2CKIT1Z](#) [LM2744EVAL](#) [LM2854EVAL](#) [LM3658SD-AEV/NOPB](#) [LM3658SDEV/NOPB](#) [LM3691TL-1.8EV/NOPB](#) [LM4510SDEV/NOPB](#) [LM5033SD-EVAL](#) [LP38512TS-1.8EV](#) [EVAL-ADM1186-1MBZ](#) [EVAL-ADM1186-2MBZ](#)