

LTM4627EV: 15A Step-Down μ Module Regulator

DESCRIPTION

Demonstration circuit 1669A features the LTM®4627EV μ Module® regulator, a high performance high efficiency step-down regulator. The LTM4627EV has an operating input voltage range of 4.5V to 20V and is able to provide an output current of up to 15A. The output voltage is programmable from 0.6V to 5V and can be remotely sensed with the internal optional differential remote sensing amplifier. The LTM4627EV is a complete DC/DC point-of-load regulator in a thermally enhanced 15mm $\times$ 15mm $\times$ 4.32mm LGA package requiring only a few input and output capacitors. This regulator is internally compensated and employs constant frequency current mode architecture, enabling a fast transient response and stable control

loop over a wide range of output capacitance. It supports frequency synchronization and Burst Mode® operation for increased light-load efficiency. Output voltage tracking is also available through the TRACK/SS pin for supply rail sequencing. The LTM4627 data sheet must be read in conjunction with this demo manual for working on or modifying demo circuit 1669.

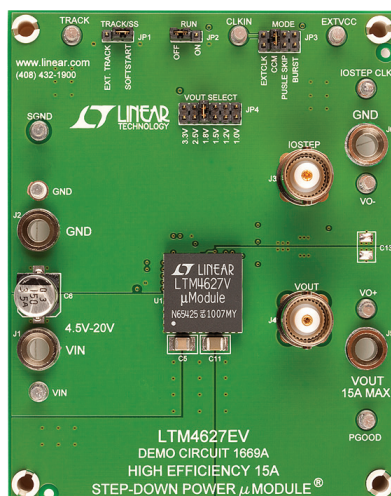
Design files for this circuit board are available at
<http://www.linear.com/demo>

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

PERFORMANCE SUMMARY

PARAMETER	CONDITIONS / NOTES	VALUE
Input Voltage Range		4.5V to 20V
Output Voltage, V_{OUT}	Jumper Selectable	1.0V _{DC} , 1.2V _{DC} , 1.5V _{DC} , 2.5V _{DC} , 1.8V _{DC} , 3.3V _{DC}
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details	15A DC
Default Operating Frequency		500kHz
External Clock Synchronous Frequency Range		250kHz to 770kHz
Efficiency	$V_{IN} = 12V$, $V_{OUT} = 1.8V$, $I_{OUT} = 15A$	86.6%, See Figure 2

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit 1669 is easy to set up to evaluate the performance of the LTM4627EV. Please refer to Figure 1 for test setup connections and follow the procedure below.

1. With power off, place the jumpers in the following positions for a typical 1.8Vout application:

JP1	JP2	JP3	JP4
TRACK/SS	RUN	MODE	V _{OUT} Select
SOFTSTART	ON	CCM	1.8V

2. Before connecting input supply, load and meters, preset the input voltage supply to be less than 20V. Preset the load current to 0A.
3. With power off, connect the load, input voltage supply and meters as shown in Figure 1.
4. Turn on input power supply. The output voltage meter should display the selected output voltage $\pm 2\%$.
5. Once the proper output voltage is established, adjust the load current within the 0A to 15A range and observe the load regulation, efficiency and other parameters. Output voltage ripple should be measured at J4 with a BNC cable and oscilloscope.

6. To observe increased light load efficiency place the Mode pin jumper (JP3) in the Burst Mode position. To observe increased light load efficiency with a reduced output ripple as compared to Burst Mode operation place the MODE pin jumper in the pulse-skipping position.
7. For optional load transient testing apply an adjustable positive pulse signal between IOSTEP CLK and GND pins. The pulse amplitude sets the load step current amplitude. The pulse width should be short ($<1\mu\text{s}$) and pulse duty cycle should be low ($<15\%$) to limit the thermal stress on the load transient circuit. The load step current can be monitored with a BNC connected to J3 (15mV/A).

Note:

To set the output voltage to 5V turn off the input supply power, apply the following changes listed below.

R7	R6	R12	JP4
Remove	0 Ω	8.25k (1%)	1V

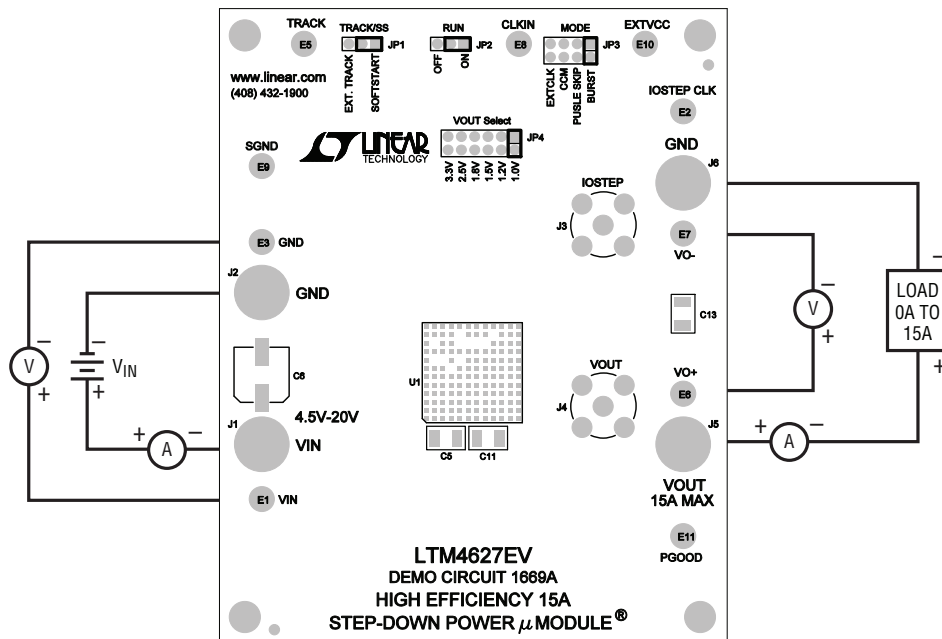
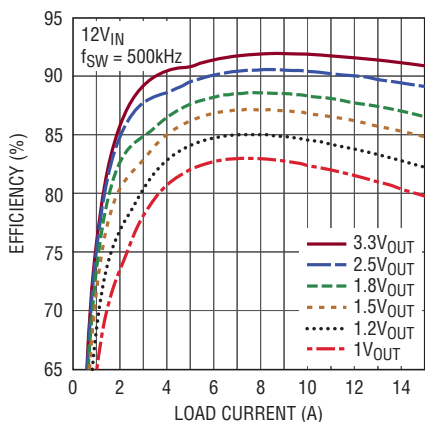
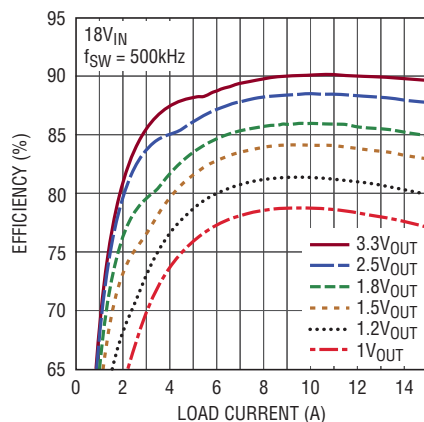


Figure 1. Test Setup of DC1669A

QUICK START PROCEDURE

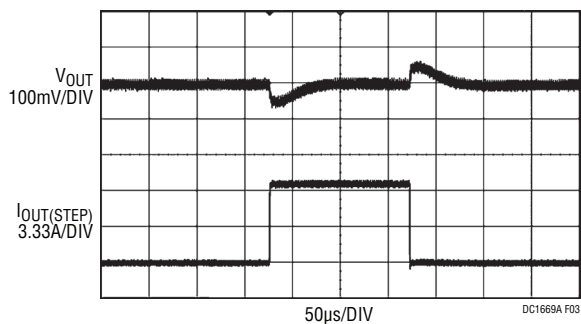


DC1669 F02b



DC1669 F02a

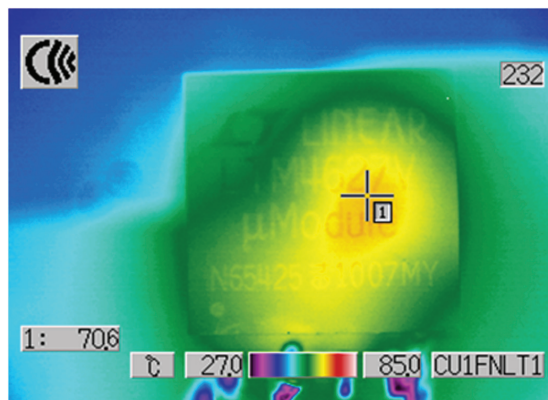
Figure 2. Measured Supply Efficiency at 12VIN and 18VIN



DC1669A F03

V _{IN} (V)	V _{OUT} (V)	C _{OUT} BULK	C _{OUT} CERAMIC	OTHER
12	1.8	330μF/6.3V POSCAP	2 × 100μF, 6.3V	C10 = 47pF C19 = 330pF

Figure 3. Measured Load Transient Response (7.5A to 15A Load Step)



V _{IN} (V)	V _{OUT} (V)	I _{OUT} (A)	AIRFLOW	AMBIENT (°C)
12	1.8	15	Natural Convection	27

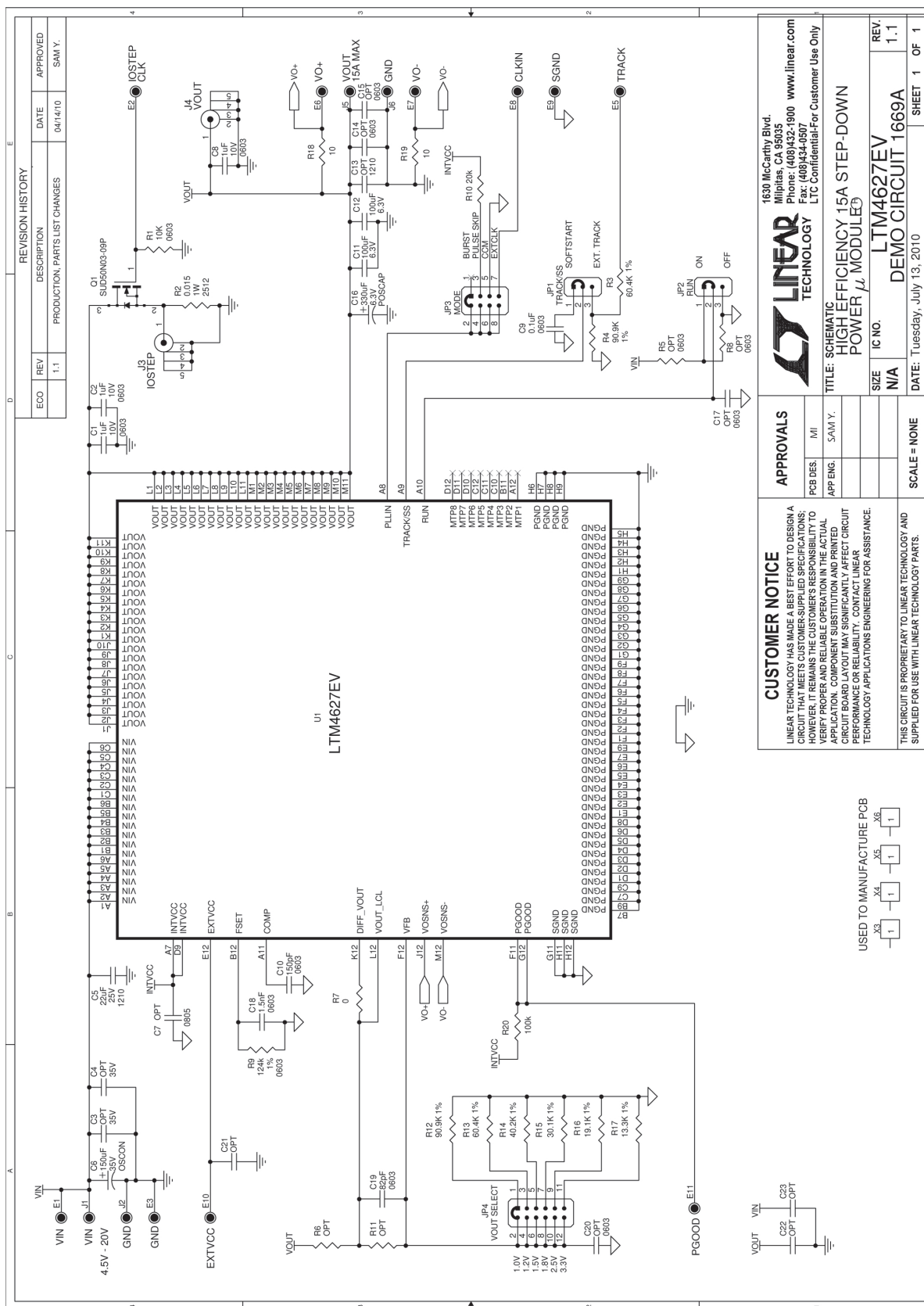
Figure 4. Measured Thermal Capture

DEMO MANUAL DC1669A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C5	CAP, 1210 22 μ F 10% 25V X5R	MURATA GRM32ER61E226KE15L
3	1	C10	CAP, 0603 150pF 10% 25V NPO	AVX 06033A151KAT2A
4	2	C11, C12	CAP, 1210 100 μ F 20% 6.3V X5R	TAIYOYUDEN JMK325BJ107MM-T
5	1	C16	CAP, 7343 330 μ F 20% 6.3V POSCAP	SANYO 6TPF330M9L
6	1	C19	CAP, 0603 82pF 5% 25V NPO	AVX 06033A820JAT2A
7	1	R7	RES, 0603 0 Ω JUMPER	VISHAY CRCW06030000Z0ED
8	1	R9	RES, 0603 124k 5% 1/10W	VISHAY CRCW0603124K0JNEA
9	1	R15	RES, 0603 30.1k 1% 1/10W	VISHAY CRCW060330K1FKEA
10	2	R18, R19	RES, 0603 10 Ω 5% 1/10W	VISHAY CRCW060310R0JNEA
11	1	U1	IC, MICRO MODULE	LINEAR TECH LTM4627EV
Additional Demo Board Circuit Components				
1	1	C6	CAP, 150 μ F 35V ALUM	SUNCON ELEC 35CE150AX
2	0	C3, C4, C13, C22, C23	CAP, 1210 OPTION	OPTION
3	0	C7	CAP, 0805 OPTION	OPTION
4	0	C14, C15, C17, C20, C21	CAP, 0603 OPTION	OPTION
5	1	Q1	XSTR, MOSFET, N-CHANNEL 30V	VISHAY SUD50N03-09P
6	4	R5, R6, R8, R11	RES, 0603 OPTION	OPTION
7	3	C1, C2, C8	CAP, 0603 1 μ F 20% 10V X5R	TAIYO YUDEN LMK107BJ105MA-T
8	1	C9	CAP, 0603 0.1 μ F 10% 50V X7R	TDK C1608X7R1H104K
9	1	C18	CAP, 0603 1.5nF 5% 25V X7R	AVX 06033A152JAT2A
10	1	R1	RES, 0603 10k 5% 1/10W	VISHAY CRCW060310K0JNEA
11	1	R2	RES, 2512 0.015 Ω 1% 1W	VISHAY WSL2512R0150FEA
12	2	R3, R13	RES, 0603 60.4k 1% 1/10W	VISHAY CRCW060360K4FKEA
13	2	R4, R12	RES, 0603 90.9k 1% 1/10W	VISHAY CRCW060390K9FKEA
14	1	R10	RES, 0603 20k 5% 1/10W	VISHAY CRCW060320K0JNEA
15	1	R14	RES, 0603 40.2k 1% 1/10W	VISHAY CRCW060340K2FKEA
16	1	R16	RES, 0603 19.1k 1% 1/10W	VISHAY CRCW060319K1FKEA
17	1	R17	RES, 0603 13.3k 1% 1/10W	VISHAY CRCW060313K3FKEA
18	1	R20	RES, 0603 100k 5% 1/10W	VISHAY CRCW0603100KJNEA
Hardware				
1	10	E1-E3, E5-E11	TURRET	MILL-MAX 2501-2-00-80-00-00-07-0
2	4	JP1, JP2, JP3, JP4	SHUNT	SAMTEC 2SN-BK-G
3	2	JP1, JP2	HEADER, 3-PIN, 2mm	SAMTEC TMM-103-02-L-S
4	1	JP3	HEADER, 4-PIN, DOUBLE ROW, 2mm	SAMTEC TMM-104-02-L-D
5	1	JP4	HEADER, 6-PIN, DOUBLE ROW, 2mm	SAMTEC TMM-106-02-L-D
6	4	J1, J2, J5, J6	JACK, BANANA	KEYSTONE 575-4
7	2	J3, J4	CONN., VERT. PC-MNT, BNC 50 Ω	CONNEX 112404
8	4		STANDOFF, SNAP ON	KEYSTONE_8834

SCHEMATIC DIAGRAM



DEMO MANUAL DC1669A

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

dc1669af