LTM4637
20A DC/DC µModule Step-Down Regulator

DESCRIPTION

Demonstration circuit DC1872A features the LTM®4637EV, a high efficiency, high density switch mode step-down power µModule® regulator. The input voltage range is from 4.5V to 20V. The output voltage is jumper programmable from 1.0V to 1.8V with a rated load current of 20A. Derating is necessary for certain V_{IN}, V_{OUT}, frequency and thermal conditions. The DC1872A offers the TRACK/SS pin, allowing the user to program output tracking or soft-start period. The DC1872A allows the user to choose pulse-skipping mode or Burst Mode® operation for higher efficiency at light load conditions.

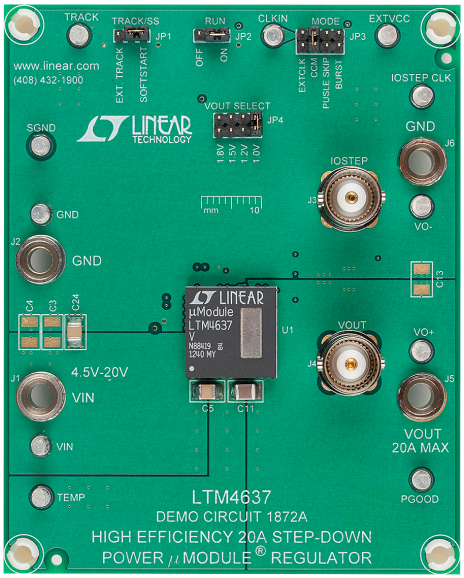
The LTM4637 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC1872A.

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

PERFORMANCE SUMMARY

PARAMETER	CONDITIONS / NOTES	VALUE
Input Voltage Range		4.5V to 20V
Output Voltage V_{OUT}	Jumper Selectable	1.0V, 1.2V, 1.5V, 1.8V ±1.5%
Maximum Continuous Output Current	Derating Is Necessary for Certain Operating Conditions. See Data Sheet for Details	20ADC
Operating Frequency	R_{fSET} =124kΩ	520kHz
Efficiency	V_{IN} = 12V, V_{OUT} = 1.0V, I_{OUT} = 20A	82.2% See Figure 2
Load Transient	V_{IN} = 12V, V_{OUT} = 1.0V	See Figure 3

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit DC1872A is an easy way to evaluate the performance of the LTM4637EV. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical 1.0V_{OUT} application:

RUN	MODE	TRACK/SS	VOUT SELECT
ON	CCM	SS	1.0V

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to be 0V.
3. Turn on the power at the input. Increase V_{IN} to 12V **(Do not apply more than the rated maximum voltage of 20V to the board or the part may be damaged).** The output voltage should be regulated and deliver the selected output voltage ±1.5%.
4. Vary the input voltage from 4.5V to 20V and adjust the load current from 0A to 20A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters. Output voltage ripple may be measured at J4 with a BNC cable and oscilloscope. The probe channel for V_{OUT} should be set at 50Ω termination resistance to match the BNC cable.
5. (Optional) For optional load transient test, apply an adjustable pulse signal between IOSTEP_CLK and GND test points. The pulse amplitude sets the load step current amplitude. Keep the pulse width short (<1ms) and pulse duty cycle low (<5%) 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).

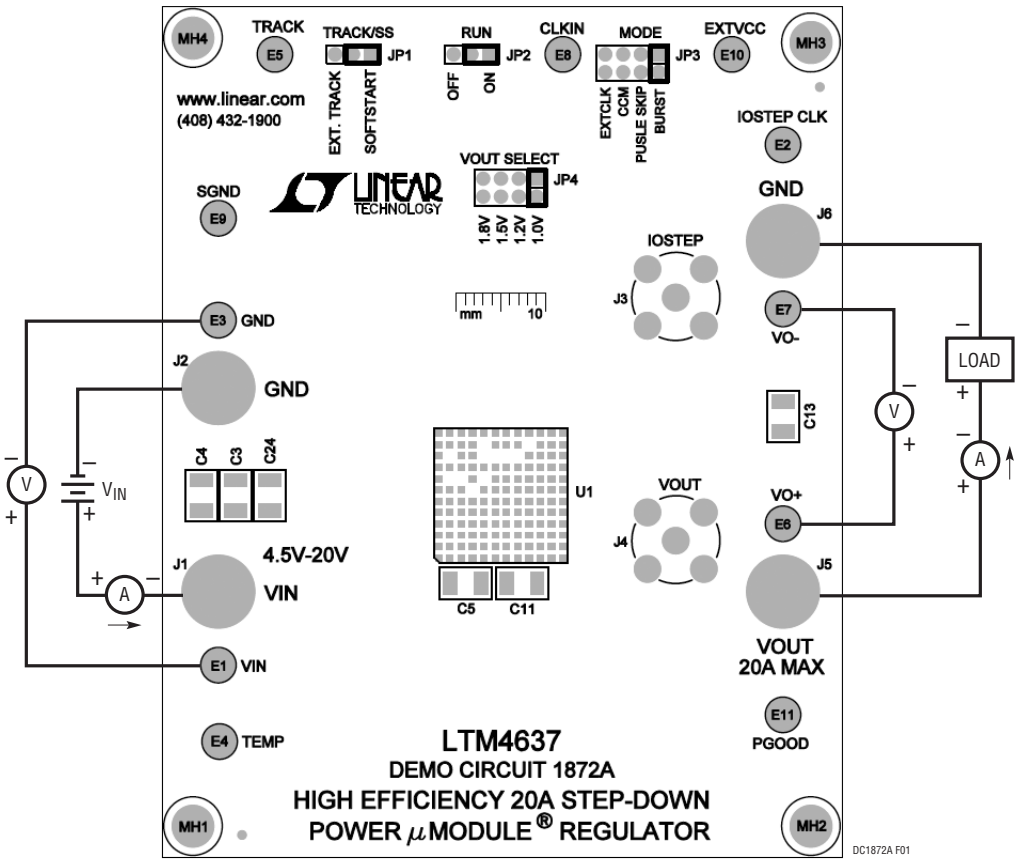
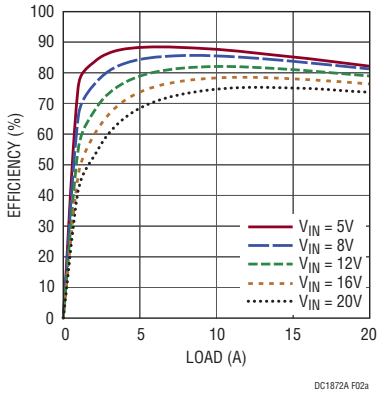
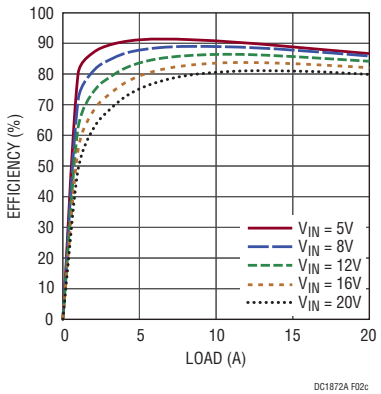


Figure 1. Proper Measurement Equipment Setup

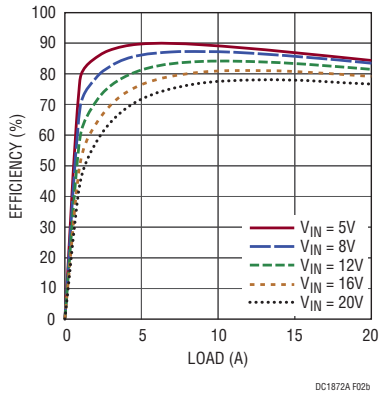
QUICK START PROCEDURE



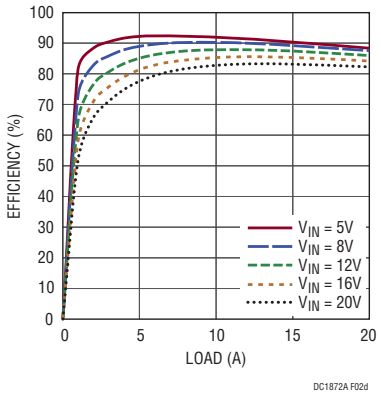
(2a) V_{OUT} = 1.0V



(2c) V_{OUT} = 1.5V



(2b) V_{OUT} = 1.2V



(2d) V_{OUT} = 1.8V

Figure 2. Measured DC1872A Efficiency at Different V_{IN} and V_{OUT} Values (CCM Mode Enabled)

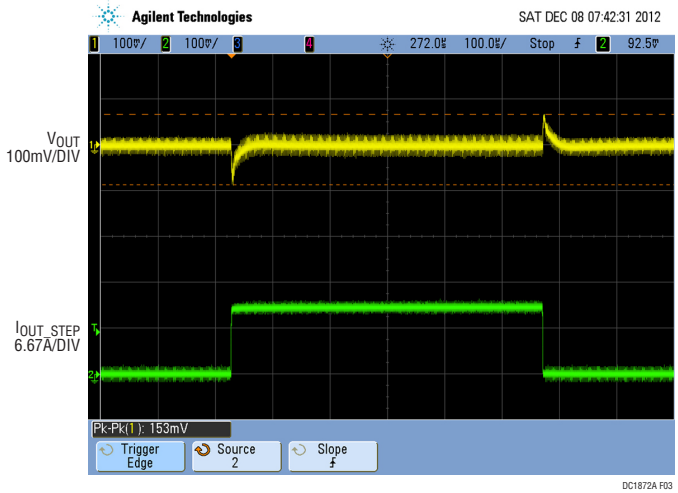


Figure 3. Measured Load Transient Response (V_{IN} = 12V, V_{OUT} = 1.0V, 0A to 10A Load Step)

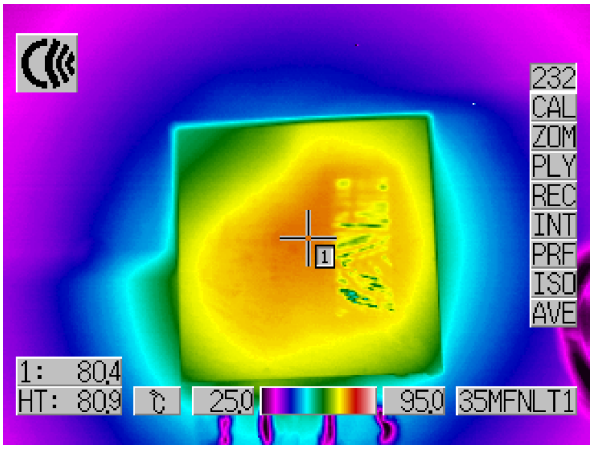
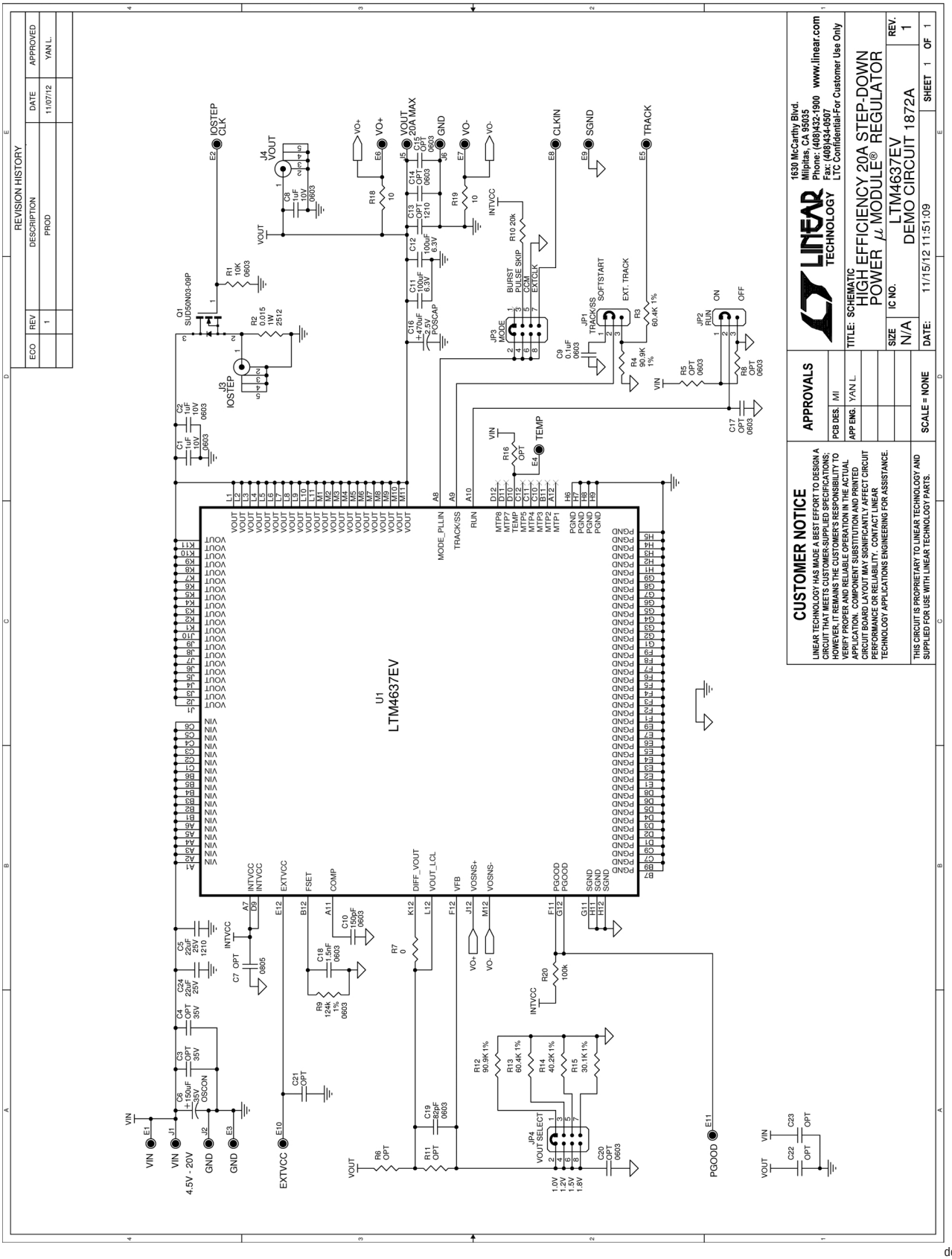


Figure 4. Thermal Image of LTM4637 (V_{IN} = 12V, V_{OUT} = 1.0V, I_{LOAD} = 20A, Ambient Temperature = 21.6°, No Forced Air Flow)

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	U1	IC, MICRO MODULE	LINEAR TECH LTM4637EV
2	2	C5, C24	CAP, 1210 22µF 10% 25V X5R	MURATA GRM32ER61E226KE15L
3	1	C6	CAP, 150µF 35V ELEC	SUN ELEC 35CE150AX
4	1	C9	CAP, 0603 0.1µF 10% 50V X7R	TDK C1608X7R1H104K
5	1	C10	CAP, 0603 150pF 10% 25V NPO	AVX 06033A151KAT2A
6	2	C11, C12	CAP, 1210 100µF 20% 6.3V X5R	TDK C3225X5R0J107M
7	1	C16	CAP, 7343 470µF 20% 2.5V POSCAP	SANYO 2R5TPE470M9
8	1	C18	CAP, 0603 1.5nF 5% 25V X7R	AVX 06033C152JAT2A
9	1	C19	CAP, 0603 82pF 5% 25V NPO	AVX 06033A820JAT2A
10	1	R9	RES, 0603 124k 1% 1/10W	VISHAY CRCW0603124K0FKEA
11	1	R20	RES. 0603 100k 5% 1/10W	VISHAY CRCW0603100KJNEA
12	1	R15	RES, 0603 30.1k 1% 1/10W	VISHAY CRCW060330K1FKEA
Additional Demo Board Components				
1	1	Q1	XSTR, MOSFET, N-CHANNEL 30V	VISHAY SUD50N03-09P-GE3
2	1	R1	RES, 0603 10k 5% 1/10W	VISHAY CRCW060310K0JNEA
3	1	R2	RES, 2512 0.015Ω 1% 1W	VISHAY WSL2512R0150FEA
4	2	R3, R13	RES, 0603 60.4k 1% 1/10W	VISHAY CRCW060360K4FKEA
5	2	R4, R12	RES, 0603 90.9k 1% 1/10W	VISHAY CRCW060390K9FKEA
6	1	R7	RES, 0603 0Ω JUMPER	VISHAY CRCW06030000Z0ED
7	1	R10	RES. 0603 20k 5% 1/10W	VISHAY CRCW060320K0JNEA
8	1	R14	RES, 0603 40.2k 1% 1/10W	VISHAY CRCW060340K2FKEA
9	2	R18, R19	RES, 0603 10Ω 5% 1/10W	VISHAY CRCW060310R0JNEA
10	3	C1, C2, C8	CAP, 0603 1µF 20% 10V X5R	TAIYO YUDEN LMK107BJ105MA-T
11	0	C3, C4, C13, C22, C23	CAP, 1210 OPTION	OPTION
12	0	C7	CAP, 0805 OPTION	OPTION
13	0	C14, C15, C17, C20, C21	CAP, 0603 OPTION	OPTION
14	0	R5, R6, R8, R11, R16	RES, 0603 OPTION	OPTION
Hardware				
1	11	E1-E11	TURRET	MILL-MAX 2501-2-00-80-00-00-07-0
2	2	JP1, JP2	HEADER, 3-PIN, 2mm	SAMTEC TMM-103-02-L-S
3	4	JP1, JP2, JP3, JP4	SHUNT	SAMTEC 2SN-BK-G
4	2	JP3, JP4	HEADER, 4-PIN, DOUBLE ROW, 2mm	SAMTEC TMM-104-02-L-D
5	4	J1, J2, J5, J6	JACK, BANANA	KEYSTONE 575-4
6	2	J3, J4	CONN., VERT. PC-MNT, BNC 50 OHM	CONNEX 112404
7	4	MH1, MH2, MH3, MH4	STANDOFF, SNAP ON	KEYSTONE_8834

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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