LTM4613
8A, High Voltage Power µModule Regulator

DESCRIPTION

Demonstration circuit DC1743A features the LTM®4613EV, an EN55022 class B certified, high input and output voltage, high efficiency, switch mode step-down power µModule® regulator. The input voltage range is from 5V to 36V. The output voltage is jumper programmable from 3.3V to 12V with a rated load current of 8A. Derating is necessary for certain V_{IN}, V_{OUT}, frequency and thermal conditions: please refer to LTM4613 data sheet for derating curves. Only input and output capacitors are needed externally. The DC1743A offers the TRACK/SS pin allowing the user to program output tracking or soft-start period. Output voltage margining can also be realized through jumper position selections.

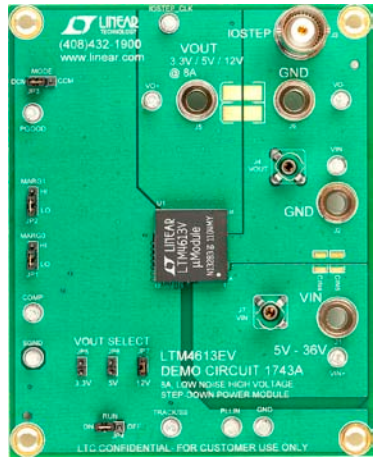
Higher efficiency at low load currents is achieved by setting the MODE pin jumper to DCM. The PLL pin is available to synchronize the LTM4613EV to an external clock. The LTM4613 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC1743A.

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

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		5V to 36V
Output Voltage V_{OUT}	Jumper Selectable	3.3V, 5V, 12V; ± 2%
Maximum Continuous Output Current	Derating Is Necessary for Certain Operating Conditions. See Data Sheet for Details.	$8A_{DC}$
Default Operating Frequency	V_{OUT} = 12V V_{OUT} = 5V V_{OUT} = 3.3V	600kHz 250kHz 165kHz
Efficiency	V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 8A	93.0% See Figure 3
Load Transient	V_{IN} = 12V, V_{OUT} = 5V	See Figure 4

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit DC1743A is an easy way to evaluate the performance of the LTM4613EV. 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 $3.3V_{OUT}$ application:

MODE	MARG1	MARG0	V_{OUT} SELECT	RUN
CCM	LO	LO	3.3V	ON

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 hot-plug the input supply or apply more than the rated maximum voltage of 36V to the board or the part may be damaged). The output voltage should be regulated and deliver the selected output voltage ± 2%.
4. Vary the input voltage from 5V to 36V and adjust the load current from 0A to 8A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.
5. To measure input or output ripple, insert the scope probe to J7 or J4.
6. 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. The pulse duty cycle should be 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 (20mV/A). The output voltage can be monitored at the probe jack J4.

QUICK START PROCEDURE

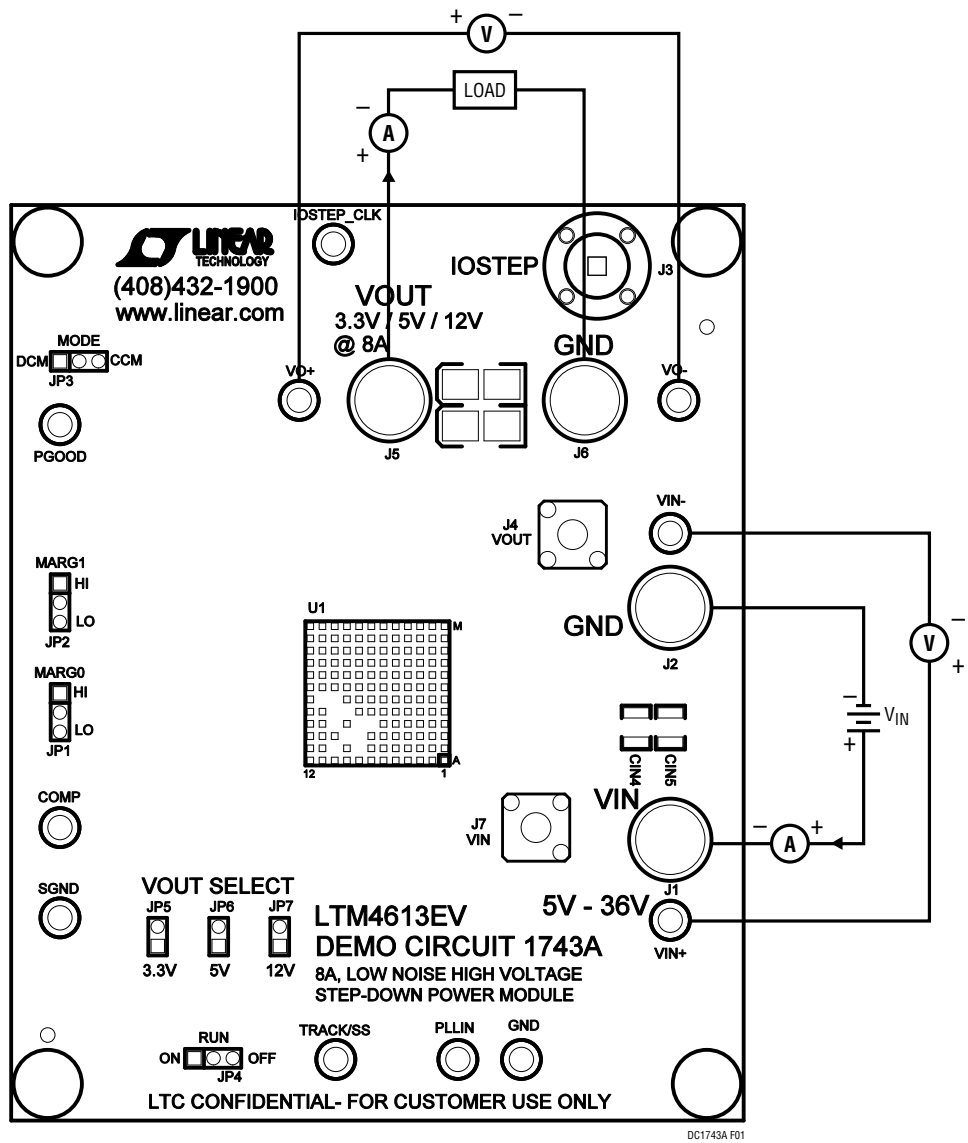


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

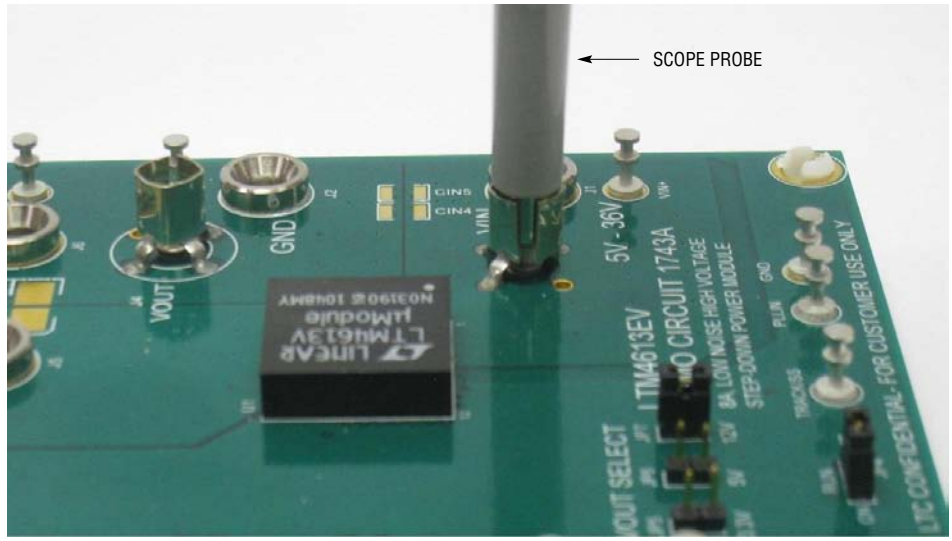


Figure 2. Measuring V_{IN} or V_{OUT} Ripple

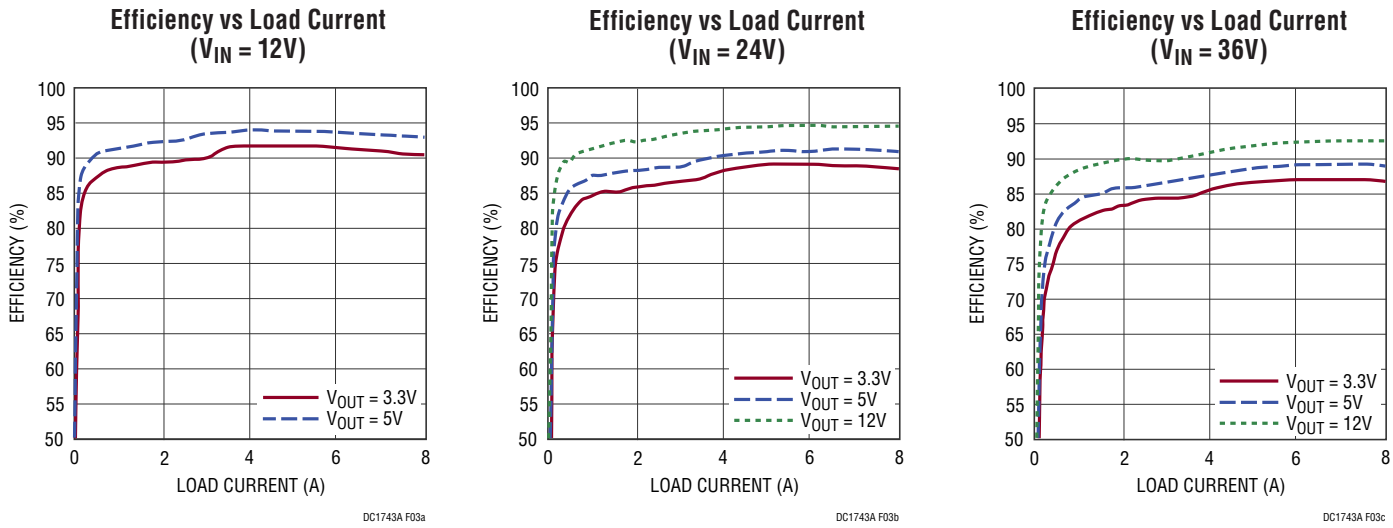
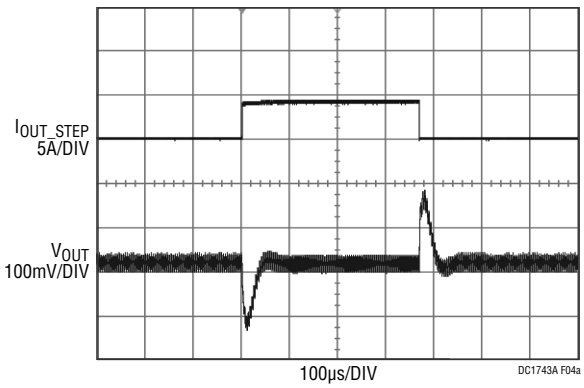
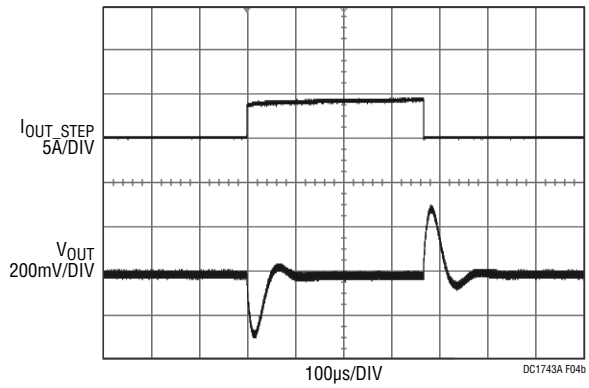


Figure 3. Measured DC1743A Efficiency at Different V_{IN} and V_{OUT} (DCM Mode Enabled)

QUICK START PROCEDURE

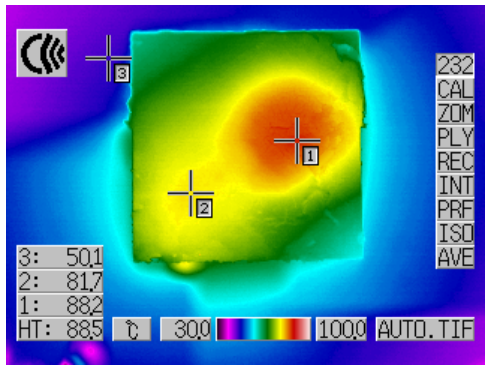


V_{IN} = 12V, V_{OUT} = 5V
0A TO 4A LOAD STEP
C_{OUT} = 1x47µF/16V/POSCAP+3x47µF/16V/X5R+1x10µF/16V/X5R



V_{IN} = 24V, V_{OUT} = 12V
0A TO 4A LOAD STEP
C_{OUT} = 1x47µF/16V/POSCAP+3x47µF/16V/X5R+1x10µF/16V/X5R

Figure 4. Measured Load Transient Responses



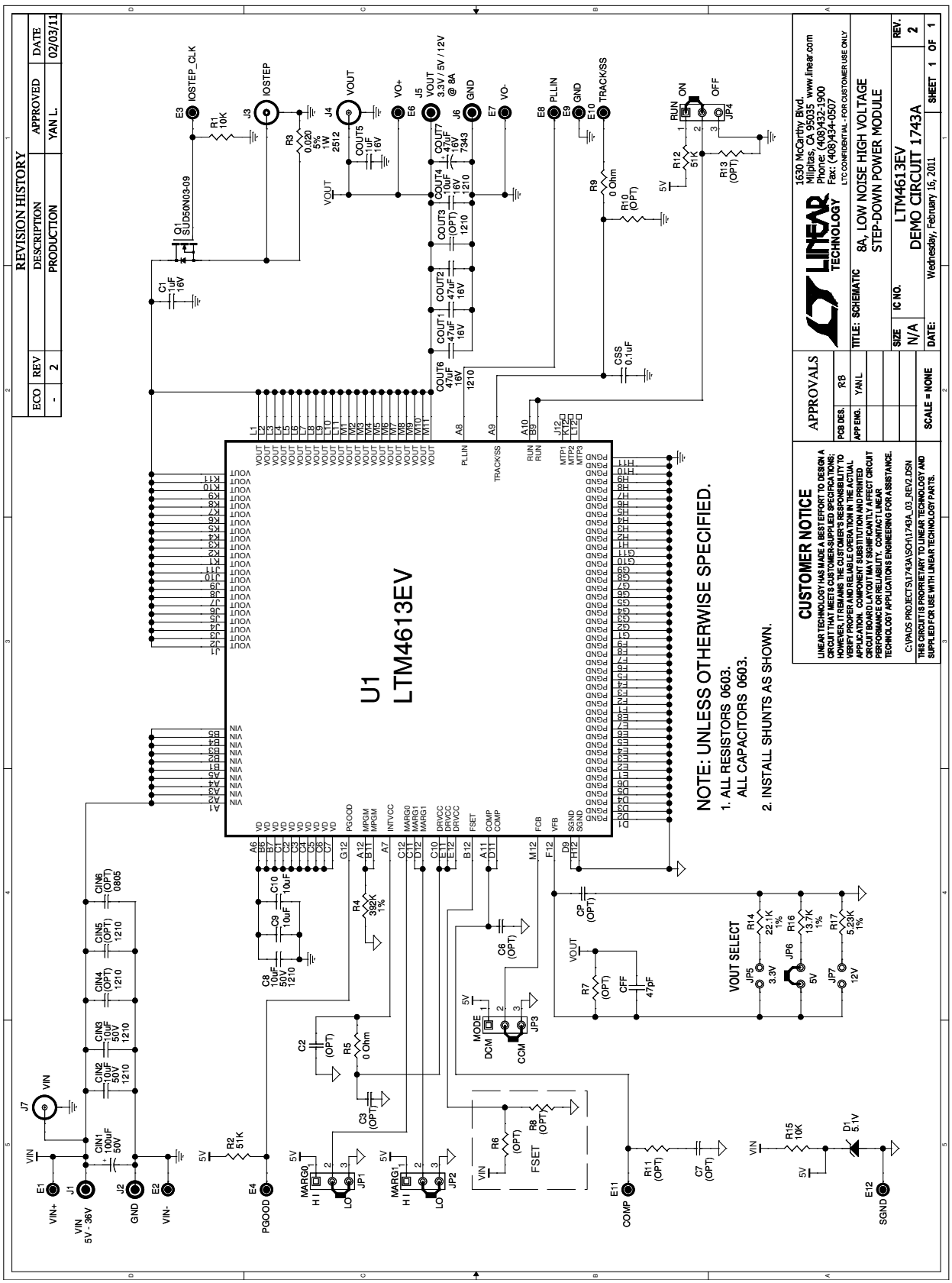
V_{IN} = 24V
V_{OUT} = 12V
I_{LOAD} = 8A
AMBIENT TEMPERATURE = 23.3°C
NO FORCED AIR FLOW

Figure 5. Thermal Image of LTM4613

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CFF	CAP, NPO 47pF 50V 10% 0603	AVX 06035A470KAT1A
2	1	CIN1	CAP, ALUM 100µF 50V 10%	SUNCON 50CE100FS
3	5	CIN2, CIN3, C8, C9, C10	CAP, X5R 10µF 50V 20% 1210	TAIYO YUDEN UMK325BJ106MM-T
4	3	COUT1, COUT2, COUT6	CAP, X5R 47µF 16V 20% 1210	TAIYO YUDEN EMK325BJ476MM
5	1	COUT4	CAP, X5R 10µF 16V 20% 1210	TDK C3225X5R1C106M
6	1	COUT5	CAP, X7R 1µF 16V 10% 0603	TDK C1608X7R1C105K
7	1	COUT7	CAP, POSCAP 47µF 16V 20% 7343	SANYO 16TQC47M
8	1	CSS	CAP, X7R 0.1µF 16V 20% 0603	AVX 0603YC104MAT2A
9	1	R14	RES, CHIP 22.1k 0.06W 1% 0603	VISHAY CRCW060322K1FKEA
10	1	R16	RES, CHIP 13.7k 0.06W 1% 0603	VISHAY CRCW060313K7FKEA
11	1	R17	RES, CHIP 5.23k 0.06W 1% 0603	YAYEO, RC0603FR-075K23L
12	2	R2, R12	RES, CHIP 51k 0.06W 5% 0603	VISHAY CRCW060351K0JNEA
13	1	R15	RES, CHIP 10k 0.06W 5% 0603	VISHAY CRCW060310K0JNEA
14	1	R4	RES, CHIP 392k 0.06W 1% 0603	VISHAY CRCW0603392KFKEA
15	1	D1	ZENER DIODE, 5.1V SOT23	ON SEMICONDUCTOR MMBZ5231B
16	1	U1	I.C., VOLTAGE REG	LINEAR TECHNOLOGY CORPORATION LTM4613EV
Additional Demo Board Circuit Components				
1	1	Q1	MOSFET, N-CHANNEL 30V	VISHAY SILICONIX SUD50N03-09
2	1	C1	CAP, X7R 1µF 16V 10% 0603	TDK C1608X7R1C105K
3	0	COUT3, CIN4, CIN5 (OPT)	CAP, 1210	
4	0	CIN6 (OPT)	CAP, 0805	
5	0	C2, C3, C6, C7, CP (OPT)	CAP, 0603	
6	1	R1	RES, CHIP 10k 0.06W 5% 0603	VISHAY CRCW060310K0JNEA
7	1	R3	RES, LRC 0.020 1W 5% 2512	IRC LRF2512-01-R020-J
8	2	R5, R9	RES, CHIP 0Ω 1/16W 1A 0603	VISHAY CRCW0603000Z
9	0	R6, R7, R8, R10, R11, R13 (OPT)	RES, 0603	
Hardware				
1	4	JP1, JP2, JP3, JP4	HEADERS, 3 PINS 2mm CTRS	SAMTEC TMM-103-02-L-S
2	3	JP5, JP6, JP7	JUMPER, 2 PINS 2mm CTRS	SAMTEC TMM-102-02-L-S
3	4	J1, J2, J5, J6	CONNECTOR, BANANA JACK	KEYSTONE 575-4
4	1	J3	BNC CONNECTOR	CONNEX 112404
5	2	J4, J7	TEST PROBE, CONNECTOR	TEKTRONIC 131-4353-00
6	11	E1 TO E4, E6 TO E12	TURRET, TESTPOINT	MILL MAX 2501-2-00-80-00-00-07-0

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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