LTM4623EY
Tiny 2A DC/DC Inverting Buck-Boost µModule Regulator

DESCRIPTION

Demonstration circuit 2721A-A features the LTM®4623 µModule® regulator, a tiny high performance high efficiency step-down regulator configured as an inverting buck-boost regulator. The DC2721A-A has an operating input voltage range of 4V to 15V and is able to provide an output current of up to 2A. The output voltage can be programmed between –0.6V and –5.5V. The LTM4623 is a complete DC/DC point of load regulator in a thermally enhanced 6.25mm × 6.25mm × 1.82mm LGA package requiring only a few input and output capacitors. The LTM4623 data sheet must be read in conjunction with this demo manual for working on or modifying demo circuit 2721A-A.

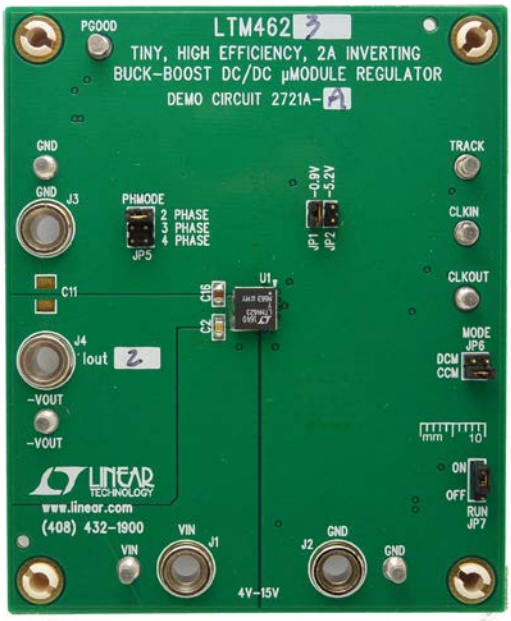
Design files for this circuit board are available at http://www.linear.com/demo/DC2721A-A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		4V to 15V
Output Voltage V_{OUT}	Jumper Selectable	$–0.9V_{DC}$, $–5.2V_{DC}$
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details	$2A_{DC}$
Default Operating Frequency		1MHz
Efficiency	V_{IN} = 12V, V_{OUT} = –2.5V, I_{OUT} = 2A	84% See Figure 2

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit 2721A-A is an easy way to evaluate the performance of the LTM4623. 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 –0.9V_{OUT} application:

JP7	JP5	JP1
RUN	MODE	V_{OUT} Select
ON	CCM	-0.9V

2. Before connecting input supply, load and meters, preset the input voltage supply to be between 4V to 15V. 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 ±2%.
5. Once the proper output voltage is established, adjust the load current within the 0A to 2A range and observe the load regulation, efficiency, and other parameters. Output voltage ripple should be measured across C12 with a BNC cable terminated into 50Ω and an oscilloscope.
6. To observe increased light load efficiency place the mode pin jumper (JP5) in the DCM position.
7. Level shifting circuits are provided for PGOOD, CLKIN and RUN signals. The CLKIN turret E6 can be connected to a ground referenced clock with amplitude up to 3.3V for optional external clock synchronization. The PGOOD turret E8 provides a ground referenced 3.3V PGOOD signal.
8. Note that CLKOUT and TRACK signals are not level shifted, these signals and are referenced to –VOUT. If ground referenced CLKOUT output and TRACK input signals are desired, external level shifting circuits for these pins are necessary.

QUICK START PROCEDURE

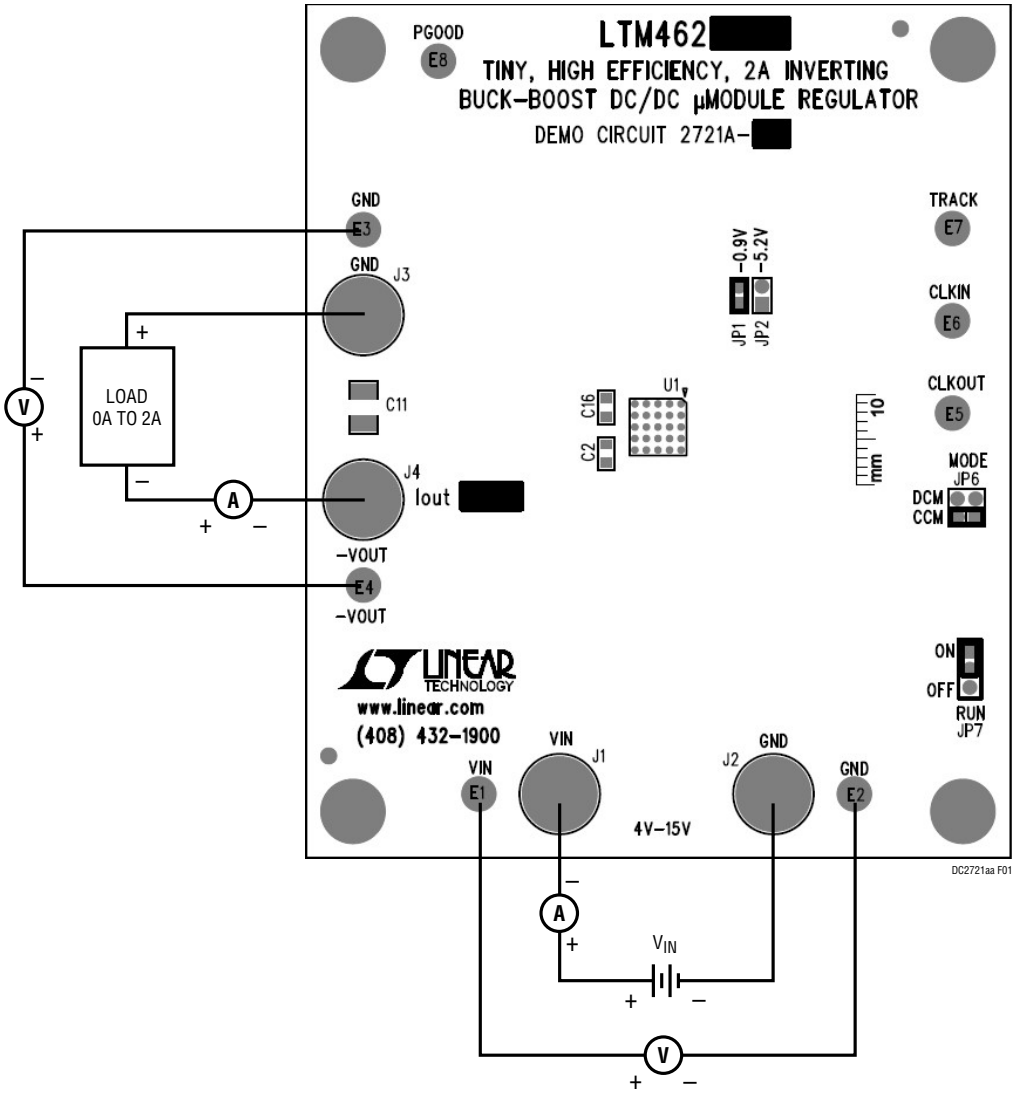
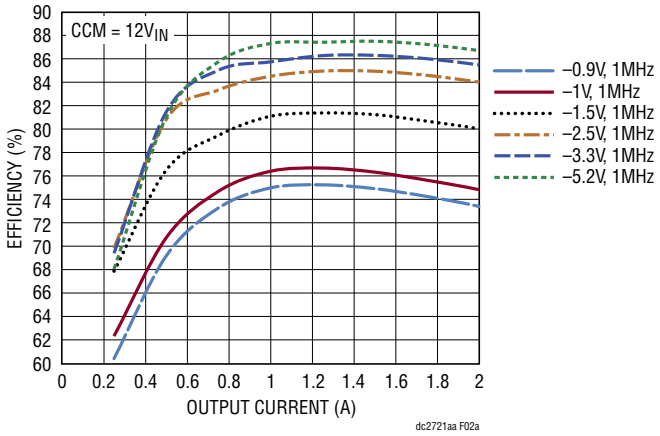


Figure 1. Test Setup

QUICK START PROCEDURE



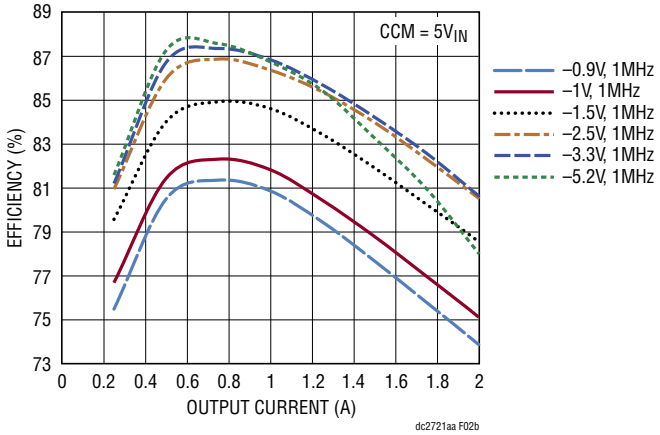
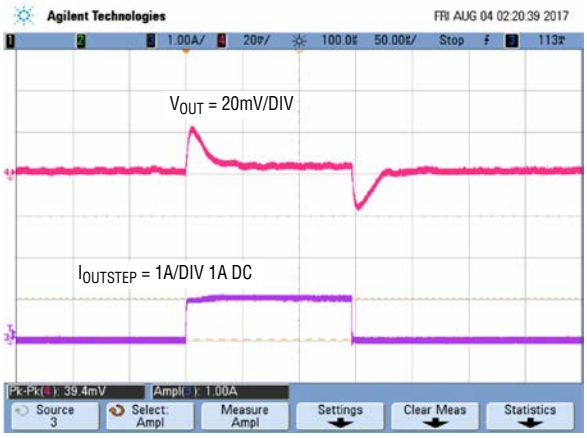


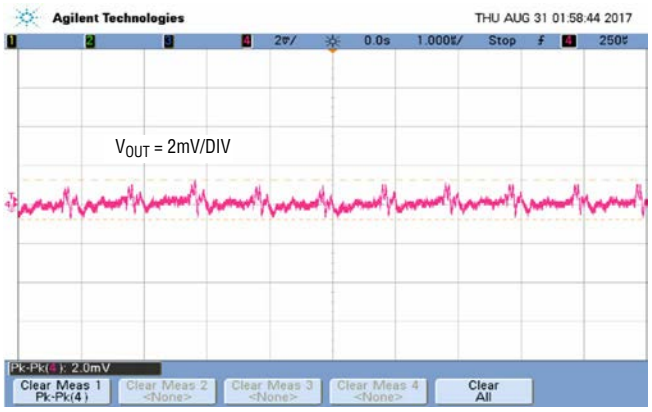
Figure 2. Measured Supply Efficiency at $12V_{IN}$ and $5V_{IN}$

QUICK START PROCEDURE



V_{IN} (V)	V_{OUT} (V)	C_{OUT}
12	–0.9	1 × 100µF/6.3V + 1 × 22µF/6.3V + 1 × 47µF/6.3V

Figure 3. Measured Load Transient Response (1A to 2A Load Step)



V_{IN} (V)	V_{OUT} (V)	I_{OUT} (A)	C_{OUT}
12	–0.9	2	1 × 100µF/6.3V + 1 × 22µF/6.3V + 1 × 47µF/6.3V

Figure 4. Measured V_{OUT} Ripple

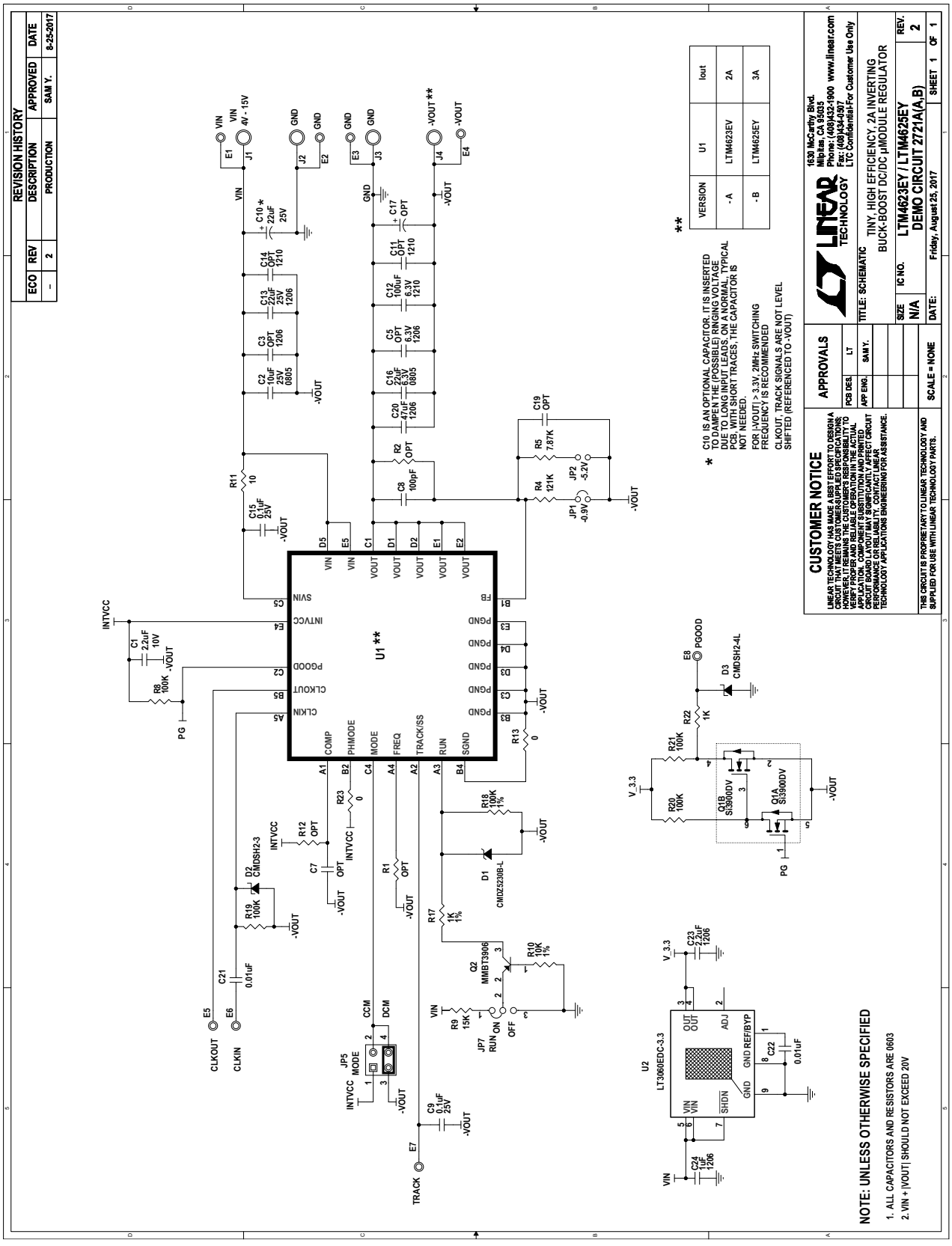
V_{IN} (V)	V_{OUT} (V)	I_{LOAD} (A)	f_{SW} (MHz)	$T_{AMBIENT}$ (C)	FORCED AIRFLOW (LFM)
12	–5.2	2	1	25	0

Figure 5. Measured Case Temperature

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, 2.2µF, X5R, 10V, 10%, 0603	MURATA, GRM188R61A225KE34D
2	1	C2	CAP, 10µF, X5R, 16V, 20%, 0805	AVX, 0805YD106MAT2A
3	0	C3, C5 (OPT)	CAP, OPTION, 1206	OPT
4	0	C7, C19 (OPT)	CAP, OPTION, 0603	OPT
5	1	C8	CAP, 100pF, X7R, 50V, 10%, 0603	AVX, 06035C101KAT2A
6	2	C9, C15	CAP, 0.1µF, X5R, 25V, 10%, 0603	AVX, 06033D104KAT2A
7	1	C10	CAP, 22µF, TANT POLY, 25V, 20%, 7343	PANSONIC, 25TQC22MV
8	0	C11, C14 (OPT)	CAP, OPTION, 1210	OPT
9	1	C12	CAP, 100µF, X5R, 6.3V, 20%, 1210	MURATA, GRM32ER60J107ME20L
10	3	C13, C23, C24	CAP, 22µF, X5R, 16V, 10%, 1206	MURATA, GRM31CR61C226ME15L
11	1	C16	CAP, 22µF, X5R, 6.3V, 20%, 0805	TDK, C2012X5R0J226M125AC
12	0	C17 (OPT)	CAP, OPTION, 7343	OPT
13	1	C20	CAP, 47µF, X5R, 6.3V, 20%, 1206	TDK, C3216X5R0J476M160AC
14	2	C21, C22	CAP, 0.01µF, X7R, 16V, 10%, 0603	AVX, 0603YC103KAT2A
15	1	D1	DIODE, ZENER, SOD323	CENTRAL SEMI, CMDZ5230B-L
16	1	D2	DIODE, SCHOTTKY, SOD323	CENTRAL SEMI, CMDSH2-3
17	1	D3	DIODE, SCHOTTKY, SOD323	CENTRAL SEMI, CMDSH2-4L
18	8	E1, E2, E3, E4, E5, E6, E7, E8	TEST POINT, TURRET, 0.094", MTG HOLE	MILL MAX 2501-2-00-80-00-00-07-0
19	2	JP1, JP2	CONN, HEADER, 1X2, 2mm	WURTH ELEKTRONIK, 62000211121
20	1	JP5	CONN, HEADER, 2X2, 2mm	WURTH ELEKTRONIK, 62000421121
21	1	JP7	CONN, HEADER, 1X3, 2mm	WURTH ELEKTRONIK, 62000311121
22	4	XJP1, XJP5, XJP6, XJP7	CONN, SHUNT, FEMALE, 2 POS, 2mm	WURTH ELEKTRONIK, 60800213421
23	4	J1, J2, J3, J4	CONN, BANANA JACK, FEMALE, THT, NON-INSULATED, SWAGE, 0.218"	KEYSTONE, 575-4
24	1	Q1	XSTR, MOSFET, N-CHAN, 20V, TSOP-6	VISHAY, Si3900DV-T1-GE3
25	1	Q2	XSTR, PNP 40V 0.2A SOT-23	ON SEMI, MMBT3906LT1G
26	0	R1, R2, R12 (OPT)	CAP, OPTION, 0603	OPT
27	1	R4	RES, 121k, 1/10W, 1%, 0603	VISHAY, CRCW0603121KFKEA
28	1	R5	RES, 7.87k, 1/10W, 1%, 0603	VISHAY, CRCW06037K87FKEA
29	5	R8, R18, R19, R20, R21	RES, 100k, 1/10W, 1%, 0603	VISHAY, CRCW0603100KFKEA
30	1	R9	RES, 15k, 1/10W, 1%, 0603	VISHAY, CRCW060315KF0KEA
31	1	R10	RES, 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
32	1	R11	RES, 10Ω, 1/10W, 1%, 0603	VISHAY, CRCW060310R0FKEA
33	2	R13, R23	RES, 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
34	2	R17, R22	RES, 1k, 1/10W, 1%, 0603	VISHAY, CRCW06031K0FKEA
35	1	U2	IC, REG LDO 3.3V 0.1A DFN8	LINEAR TECH, LT3060EDC-3.3#TRPBF
36	4	MH1, MH2, MH3, MH4	STANDOFF, NYLON, SNAP-ON, 0.375"	KEYSTONE, 8832
37	2		STENCILS (TOP AND BOTTOM)	STENCIL DC2721A

SCHEMATIC DIAGRAM



ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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