

LTM4636-1 40A DC/DC μ Module Regulator with Overvoltage/Overtemperature Protection

DESCRIPTION

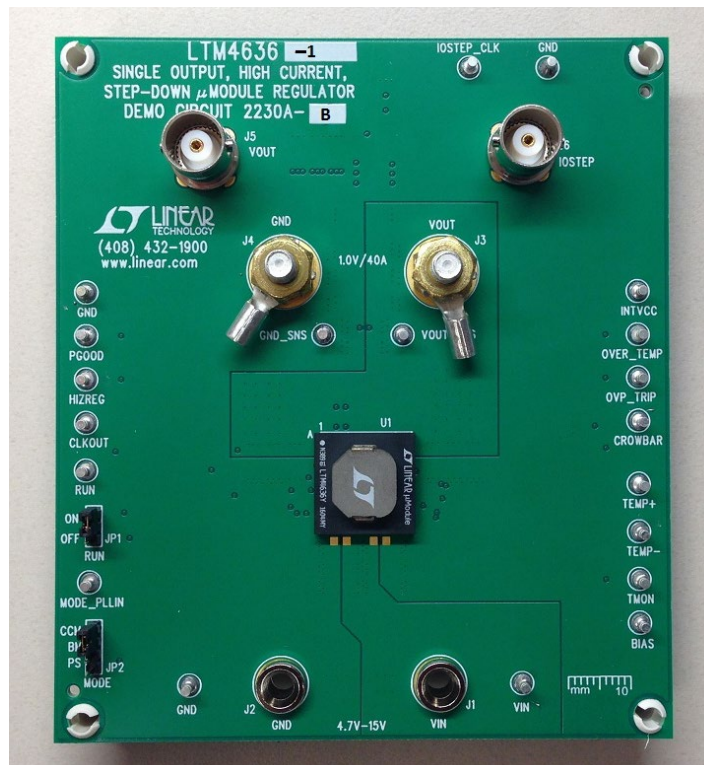
Demonstration circuit 2230A-B features the [LTM[®]4636-1EY](#), a 40A high efficiency, switch mode step-down power μ Module[®] regulator with overtemperature and input/output overvoltage protection. The input voltage range is from 4.7V to 15V. For input voltage range from 4.7V to 5.5V, short PV_{CC} pin to V_{IN} pin with R8 = R21 = 0 Ω and remove R17. The output voltage range is 0.6V to 3.3V. Derating is necessary for certain V_{IN}, V_{OUT}, frequency and thermal conditions. The board operates in continuous conduction mode in heavy load conditions. For high efficiency at low load currents, the MODE_PLLIN jumper selects pulse-skipping mode for noise sensitive applications or Burst Mode[®] operation in less noise sensitive applica-

tions. The MODE_PLLIN pin also allows the LTM4636 to synchronize to an external clock signal. DC2230A-B has the option of choosing both internal and external compensation circuit for LTM4636-1. Tying the PHASMD pin to different voltage generates certain phase difference between MODE_PLLIN and CLKOUT. The LTM4636-1 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC2230A-B.

Design files for this circuit board are available at <http://www.linear.com/demo/DC2230A-B>

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BOARD PHOTO



PERFORMANCE SUMMARY

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		4.7V to 15V
Output Voltages		1.0V ± 1.3%
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details.	40ADC
Operating Frequency		350kHz
Efficiency	$V_{IN} = 12V, V_{OUT} = 1.0V, I_{OUT} = 40A, Q2$ Not Included	87.7% (see Figure 2)
Load Transient	$V_{IN} = 12V, V_{OUT} = 1.0V, I_{STEP} = 0A$ to 10A	81mV (see Figure 3)
Overtemperature Trip Point	$R_{OTP} = R_{56} = 66.5k\Omega$	130°C
Overvoltage Trip Point	$R_{OVP} = R_{10} = 86.6k\Omega$	1.18V

QUICK START PROCEDURE

Demonstration circuit 2230A-B is an easy way to evaluate the performance of the LTM4636-1EY. 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 application:

MODE	RUN
CCM	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 12V.

3. Turn on the power supply at the input. The output voltage should be 1.0V ± 1.3% (0.987V to 1.013V).

4. Vary the input voltage from 6V to 15V and adjust the load current from 0A – 40A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.

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.

6. (Optional) LTM4636 can be synchronized to an external clock signal. Place the JP1 jumper on EXT_CLK and apply a clock signal (0V to 5V, square wave) on the MODE_PLLIN test point.

QUICK START PROCEDURE

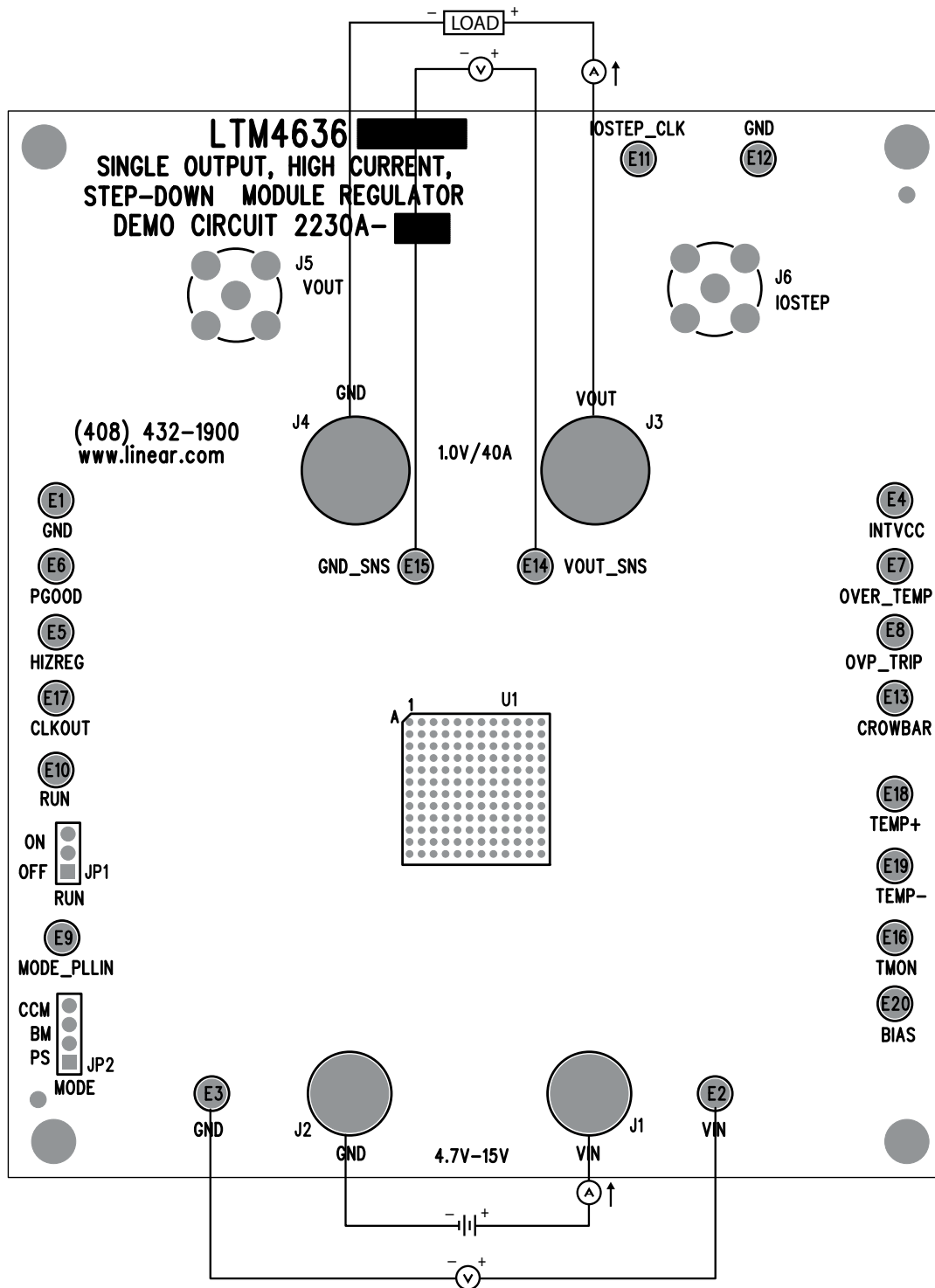


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

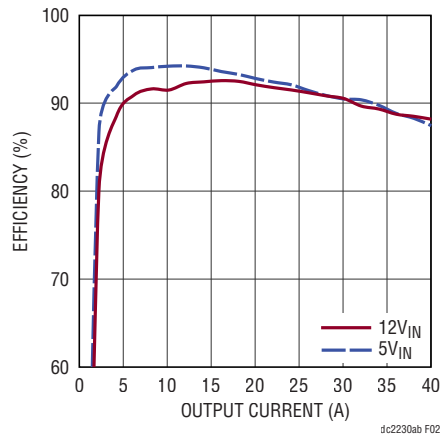


Figure 2. Measured Efficiency at $V_{IN} = 5V/12V$, $V_{OUT} = 1V$, $f_{SW} = 350kHz$, CCM, Q2 Not Included

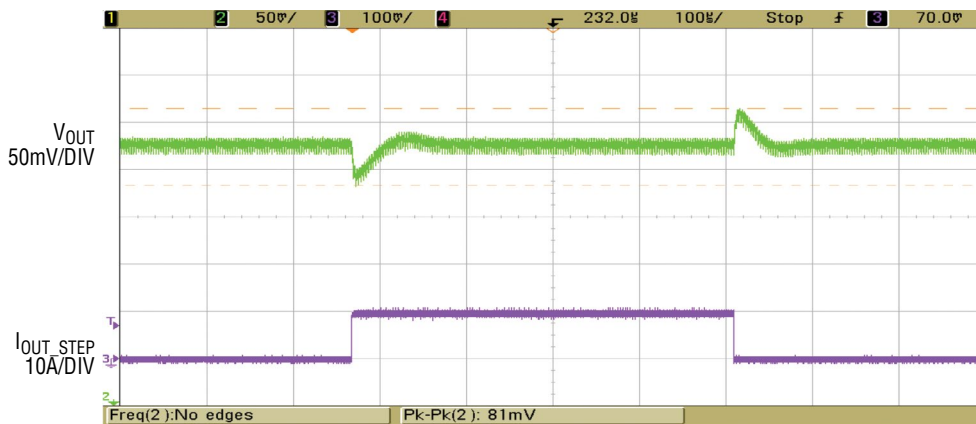


Figure 3. Measured Load Transient, $V_{IN} = 12V$, $V_{OUT} = 1.0V$, $I_{STEP} = 0A$ to $10A$



Figure 4. Thermal Image, $V_{IN} = 12V$, $V_{OUT} = 1.0V$, $I_{LOAD} = 40A$, Ambient Temperature = $23.0^{\circ}C$, No Forced Airflow

dc2230abf

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART #
Required Circuit Components				
1	1	CIN1	CAP, ALUM ELECT, 150µF, 25V, CE SERIES	SUN ELECT, 25CE150AX
2	6	CIN4, CIN5, CIN6, CIN7, CIN8, CIN9	CAP, 22µF, X5R, 16V, 20%, 1210	MURATA, GRM32ER61C226ME20
3	8	COUT1, COUT2, COUT3, COUT4, COUT6, COUT7, COUT11, COUT12	CAP, 100µF, X5R, 6.3V, 20%, 1210	MURATA, GRM32ER60J107ME20L
4	3	COUT8, COUT13, COUT14	CAP, POSCAP, 470µF, 2.5V, 20%, D3L	PANASONIC, 2R5TPE470M9
5	1	C15	CAP, 100pF, NPO, 50V, 5%, 0603	MURATA, GRM1885C1H101JA01D
6	1	C17	CAP, 0.01µF, X7R, 25V, 10%, 0603	AVX, 06033C103KAT2A
7	1	C18	CAP, 2200pF, X7R, 25V, 10%, 0603	MURATA, GRM188R71E222KA01D
8	2	C19, C25	CAP, 0.1µF, X5R, 16V, 10%, 0603	MURATA, GRM188R61C104KA01D
9	1	C22	CAP, 4.7µF, X5R, 10V, 10%, 0603	TDK, C1608X5R1A475K080AC
10	1	C23	CAP, 1µF, X5R, 25V, 10%, 0603	MURATA, GRM188R61E105KA12D
11	1	C24	CAP, 22µF, X5R, 6.3V, 20%, 0805	KEMET, C0805C226M9PACTU
12	1	C26	CAP, 1µF, X5R, 25V, 10%, 0603	MURATA, GRM188R61E105KA12D
13	1	Q1	XSTR, MOSFET, N-CH, 40V, 50A, TO-252	VISHAY, SUD50N04-8M8P-4GE3
14	1	R9	RES, 7.5k, 0.5%, 0603	VISHAY, CRCW06037K5FKEA
15	1	R10	RES, 86.6k, 1/10W, 1%, 0603	VISHAY, CRCW060386K6FKEA
16	4	R11, R12, R16, R54	RES, 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
17	2	R13, R14	RES, 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
18	1	R18	RES, 15k, 1/10W, 1%, 0603	VISHAY, CRCW060315K0FKEA
19	1	R20	RES, 100k, 1/10W, 1%, 0603	VISHAY, CRCW0603100K0FKEA
20	2	R25, R32	RES, 10Ω, 1/10W, 1%, 0603	VISHAY, CRCW060310R0FKEA
21	1	R35	RES, 2.2, 1/8W, 5%, 0805	VISHAY, CRCW08052R20JNEA
22	1	R40	RES, 34.8k, 1/10W, 1%, 0603	VISHAY, CRCW060334K8FKEA
23	1	R55	RES, SENSE, 0.01Ω, 1/2W, 1%, 2010	VISHAY, WSL2010R0100FEA
24	1	R56	RES, 66.5k, 1/10W, 1%, 0603	VISHAY, CRCW060366K5FKEA
25	1	U1	LTM4636-1EY#PBF, 16X16X5.01 BGA	LINEAR TECHNOLOGY, LTM4636-1EY#PBF
Additional Demo Board Circuit Components				
1	0	COUT9 (OPT)	CAP, OPTION, D3L	OPT
2	0	COUT10, COUT15, COUT16 (OPT)	CAP, OPTION, 1210	OPT
3	0	C14, C16 (OPT)	CAP, OPTION, 0603	OPT
4	0	R8, R15, R19, R21, R22, R38 (OPT)	RES, OPTION, 0603	OPT
5	4	R17, R23, R24, R33	RES, 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
6	0	Q2	XSTR, OPT, TO-252	OPT

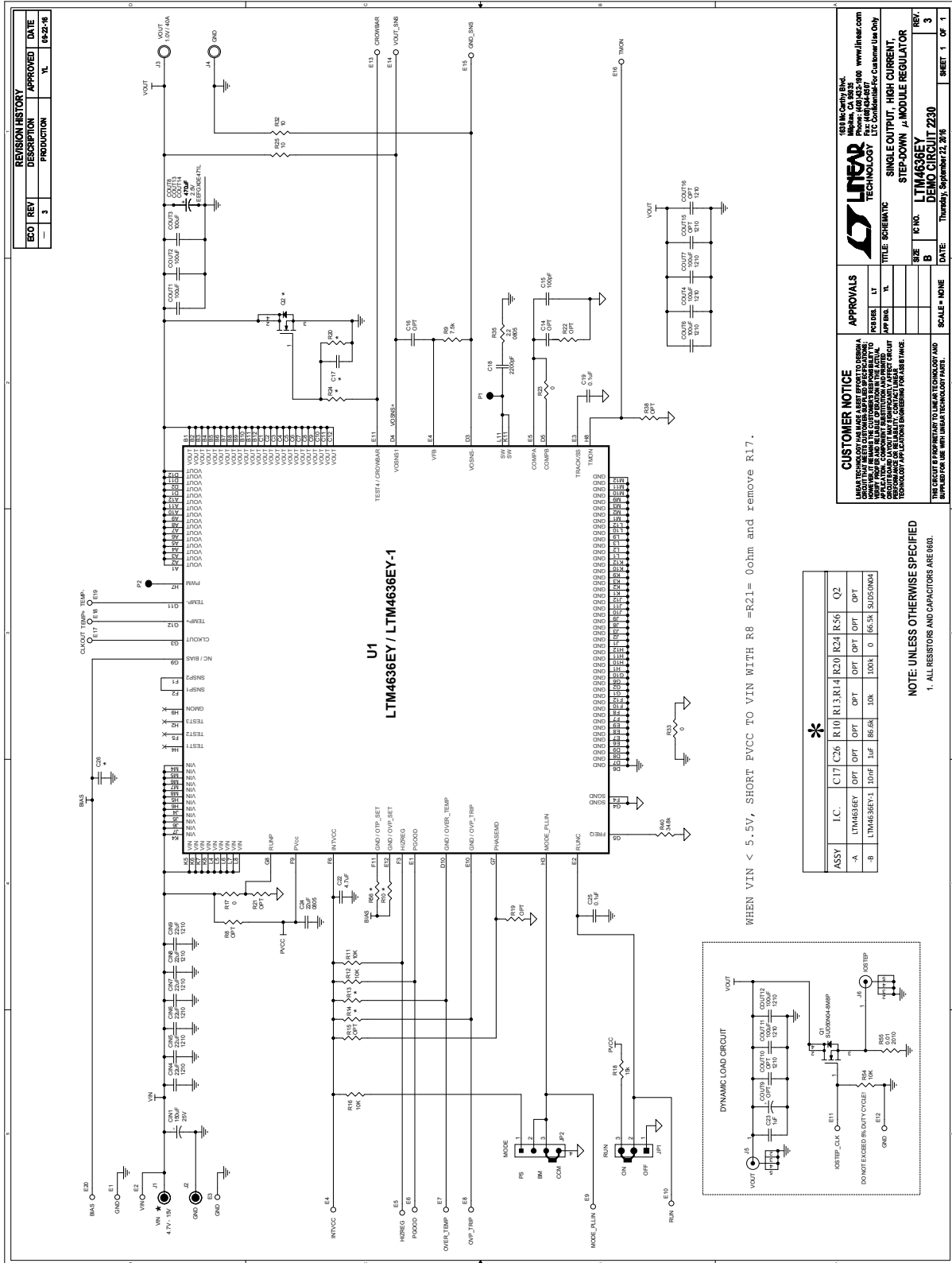
DEMO MANUAL DC2230A-B

PARTS LIST

Hardware

1	20	E1 TO E20	TEST POINT, TURRET, 0.064" MTG. HOLE	MILL-MAX, 2308-2-00-80-00-00-07-0
2	1	JP1	CONN, HEADER, 1 x 3, 2mm	SULLINS, NRPN031PAEN-RC
3	1	JP2	CONN, HEADER, 1 x 4, 2mm	SULLINS, NRPN041PAEN-RC
4	2	J1, J2	CONN, JACK, BANANA, NON-INSULATED, 0.218"	KEYSTONE, 575-4
5	2	J3, J4	STUD, TEST PIN	PEM, KFH-032-10
6	4	J3, J4 x 2	NUT, BRASS 10-32	ANY, #10-32M/S BR PL
7	2	J3, J4	RING, LUG #10	KEYSTONE, 8205
8	2	J3, J4	WASHER, TIN PLATED BRASS	ANY, #10 EXT BZ TN
9	2	J5, J6	CONN, BNC, 5PINS	CONNEX, 112404
10	2	XJP1, XJP2	SHUNT, 2mm	SAMTEC 2SN-BK-G
11	4	(STAND-OFF)	STANDOFF, NYLON, SNAP-ON, 0.500"	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



DEMO MANUAL DC2230A-B

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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

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