LTM4676EY
26A Step-Down µModule Regulator with PMBus Power System Management

DESCRIPTION

Demonstration circuit 2087A is a single-output, high efficiency, high density, µModule® regulator with 4.5V to 16V input range. It can supply 26A maximum load current. The demo board has a LTM®4676 µModule regulator, which is a dual 13A or single 26A step-down regulator with PMBus power system management. Please see LTM4676 data sheet for more detailed information.

DC2087A powers up to default settings and produces power based on configuration resistors without the need for any serial bus communication. This allows easy evaluation of the DC/DC converter. To fully explore the extensive power system management features of the part, download the GUI software LTpowerPlay™ onto your PC and use LTC's I²C/SMBus/PMBus dongle DC1613A to connect to the board. LTpowerPlay allows the user to reconfigure the part on the fly and store the configuration in EEPROM, view telemetry of voltage, current, temperature and fault status.

GUI Download

The software can be downloaded from:

http://www.linear.com/ltpowerplay

For more details and instructions of LTpowerPlay, please refer to LTpowerPlay GUI for LTM4676 Quick Start Guide.

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

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BOARD PHOTO

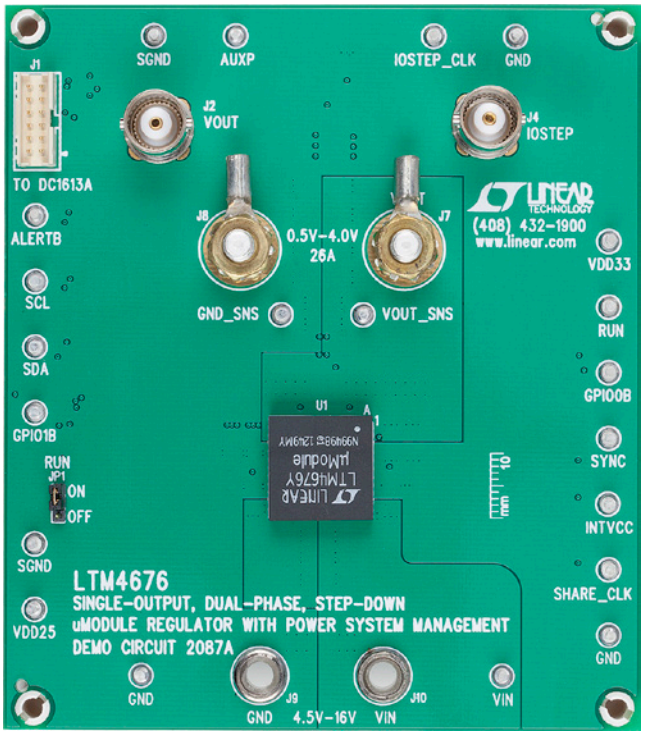


Figure 1. Single-Output LTM4676/DC2087A Demo Circuit

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITION	VALUE
Input Voltage Range		4.5V to 16V
Output Voltage, V_{OUT}	V_{IN} = 4.5 to 16V, I_{OUT} = 0A to 26A	0.5V to 4V, Default: 1V
Maximum Output Current, I_{OUT}	V_{IN} = 4.5 to 16V, V_{OUT} = 0.5V to 4V	26A
Typical Efficiency	V_{IN} = 12V, V_{OUT} = 1.2V, I_{OUT} = 26A	83.2%
Default Switching Frequency		350kHz

QUICK START PROCEDURE

Table 1. LTM4676 Demo Cards for Up to 100A Point-of-Load Regulation

MAXIMUM OUTPUT CURRENT	NUMBER OF OUPUT VOLTAGES	NUMBER OF LTM4676 µMODULE REGULATORS ON THE BOARD	DEMO BOARD NUMBER
13A, 13A	2	1	DC1811A
26A	1	1	DC2087A
50A	1	2	DC1989A-A
75A	1	3	DC1989A-B
100A	1	4	DC1989A-C
100A	1	1(+3 × LTM4620A)	DC2106A-A
130A	1	1(+3 × LTM4630)	DC2106A-B

Demonstration circuit 2087A is easy to set up to evaluate the performance of the LTM4676EY. Refer to Figure 2 for the proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to VIN (4.5V–16V) and GND (input return).
2. Connect the 1.0V output load between VOUT and GND (Initial load: no load).
3. Connect the DVMs to the input and outputs. Set default jumper position: JP1: ON.
4. Turn on the input power supply and check for the proper output voltages. V_{OUT} should be 1.0V ±1 %.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.
6. Connect the dongle and control the output voltages from the GUI. See LTpowerPlay GUI for the LTM4676 Quick Start Guide for details.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 3 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (–) terminals of an output capacitor. The probe's ground ring needs to touch the (–) lead and the probe tip needs to touch the (+) lead.

Connecting a PC to DC2087A

You can use a PC to reconfigure the power management features of the LTM4676 such as: nominal V_{OUT}, margin set points, OV/UV limits, temperature fault limits, sequencing parameters, the fault log, fault responses, GPIOs and other functionality. The DC1613A dongle may be plugged when V_{IN} is present.

QUICK START PROCEDURE

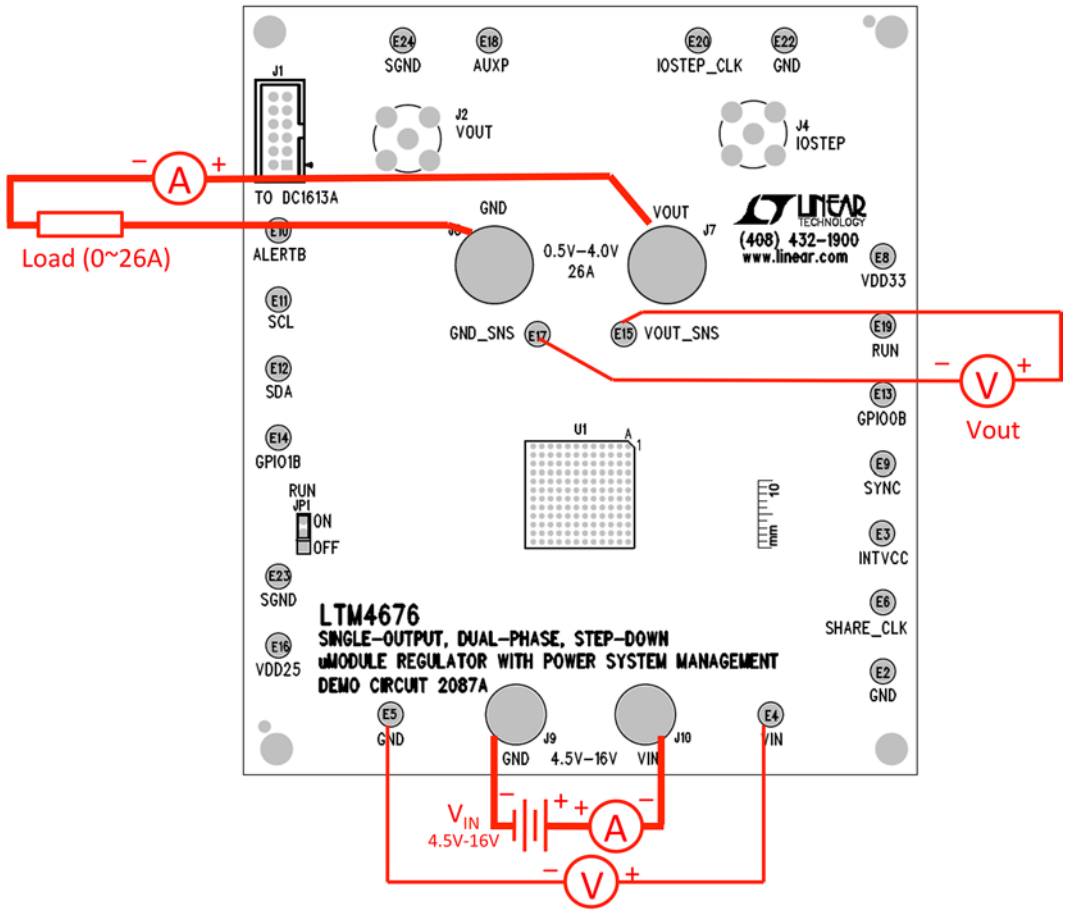


Figure 2. Proper Measurement Equipment Setup

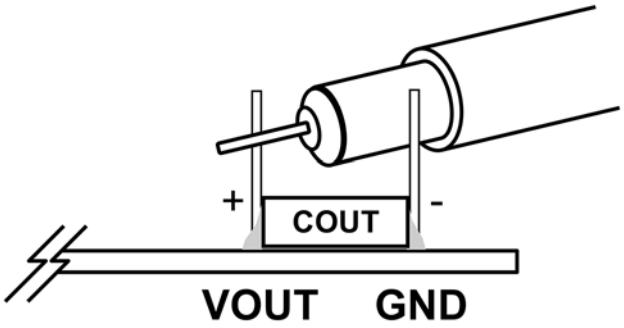


Figure 3. Proper Measurement Equipment Setup

QUICK START PROCEDURE

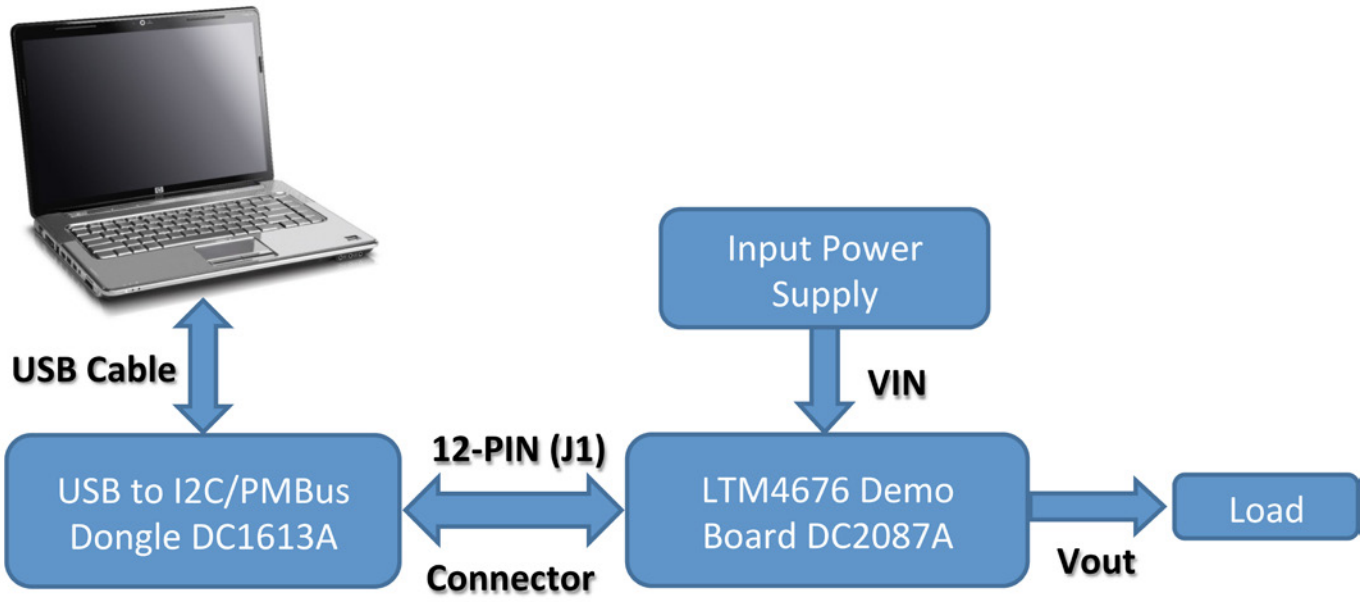


Figure 4. Demo setup with PC

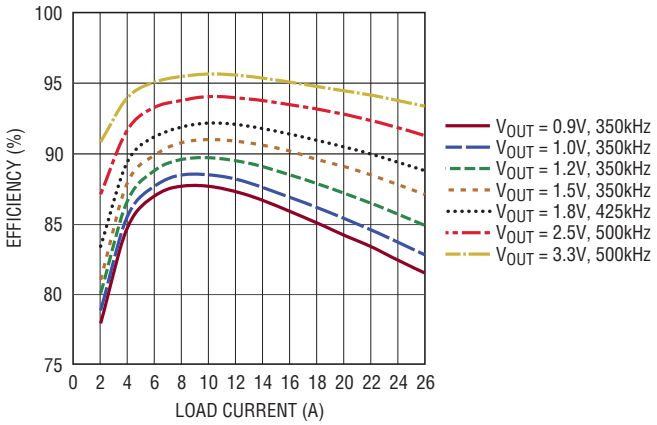


Figure 5. Efficiency vs Load Current at V_{IN} = 5V

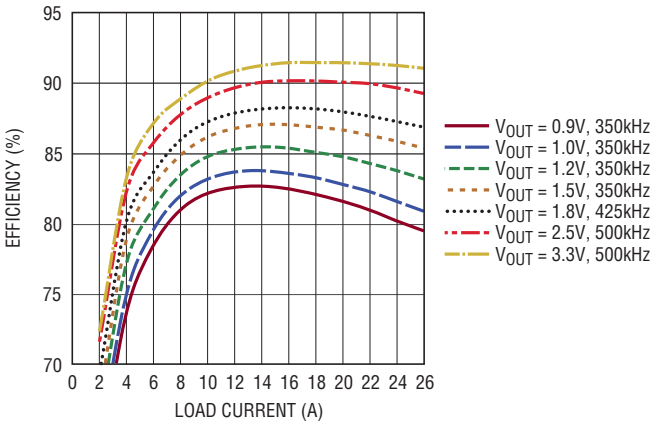
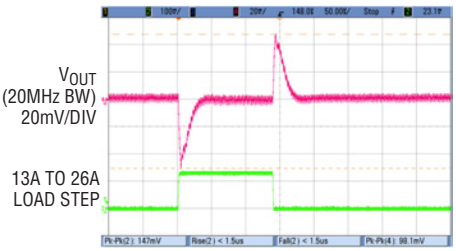
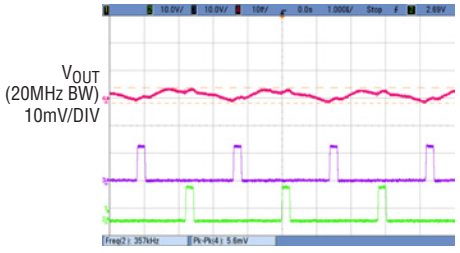


Figure 6. Efficiency vs Load Current at V_{IN} = 12V



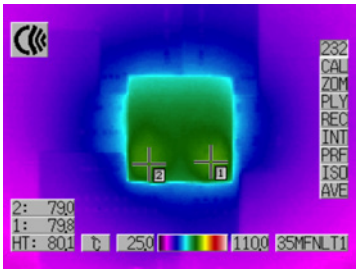
V_{IN} = 12V
V_{OUT} = 1V
f_{SW} = 350kHz
V_{OUT} RANGE = 0

Figure 7. Output Voltage V_{OUT} vs Load Current



V_{IN} = 12V
V_{OUT} = 1V

Figure 8. Output Voltage Ripple



V_{IN} = 12V
V_{OUT} = 1V
I_{OUT} = 26A
f_{SW} = 350kHz
T_A = 23°C
NO AIRFLOW

Figure 9. Thermal Performance

LTpowerPlay SOFTWARE GUI

LTpowerPlay is a powerful Windows-based development environment that supports Linear Technology power system management ICs, including the LTM4676, LTC®3880, LTC3883, LTC2974 and LTC2978. The software supports a variety of different tasks. You can use LTpowerPlay to evaluate Linear Technology ICs by connecting to a demo board system. LTpowerPlay can also be used in an offline mode (with no hardware present) in order to build a multichip configuration file that can be saved and reloaded at a later time. LTpowerPlay provides unprecedented diagnostic and debug features. It becomes a valuable diagnostic tool during board bring-up to program or tweak the power management scheme in a system, or to diagnose power issues when bringing up rails. LTpowerPlay utilizes the DC1613A USB-to-SMBus controller to communicate with one of many potential targets, including the LTM4676, the LTC3880 and the LTC3883's demo system, or a customer board. The software also provides an automatic update feature to keep the software current with the latest set of device drivers and documentation. The LTpowerPlay soft-ware can be downloaded from:

http://www.linear.com/ltpowerplay

To access technical support documents for LTC Digital Power Products visit Help. View online help on the LTpowerPlay menu.

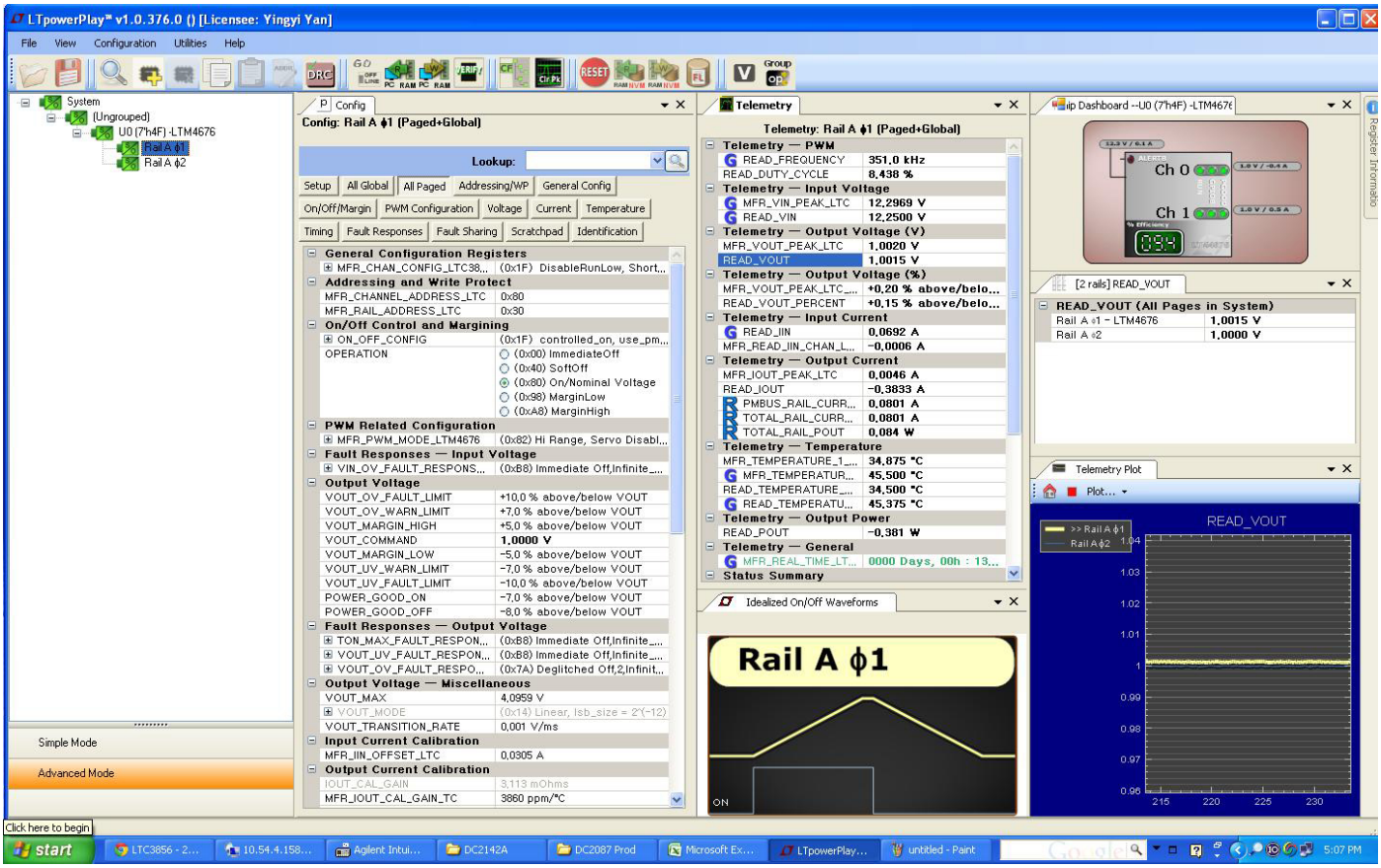


Figure 10. LTpowerPlay Main Interface

LTpowerPlay QUICK START PROCEDURE

The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTM4676.

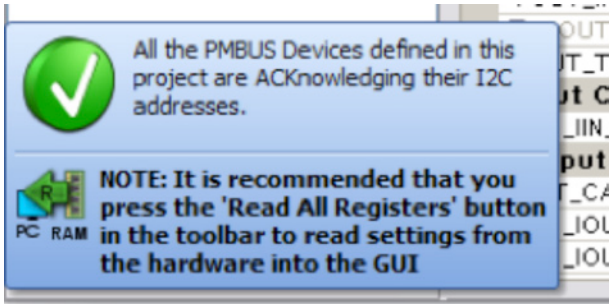
1. Download and install the LTPowerPlay GUI:

   http://www.linear.com/ltpowerplay

2. Launch the LTpowerPlay GUI.

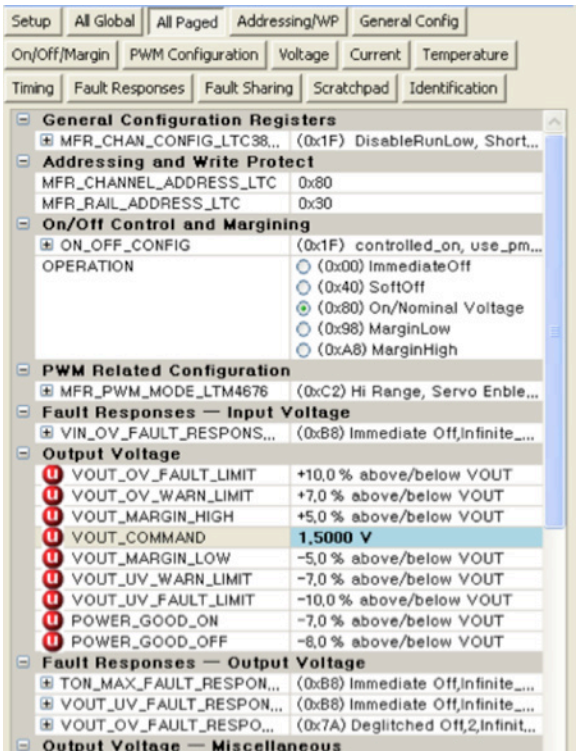
a. The GUI should automatically identify the DC2087A. The system tree on the left hand side should look like this:

b. A green message box shows for a few seconds in the lower left hand corner, confirming that LTM4676 is communicating:



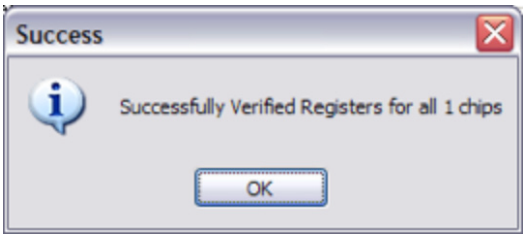
c. In the Toolbar, click the "R" (RAM to PC) icon to read the RAM from the LTM4676. This reads the configuration from the RAM of LTM4676 and loads it into the GUI.

d. If you want to change the output voltage to a different value, like 1.5V. In the Config tab, type in 1.5 in the VOUT_COMMAND box, like this:



Then, click the "W" (PC to RAM) icon to write these register values to the LTM4676. After finishing this step, you will see the output voltage will change to 1.5V.

If the write is successful, you will see the following message:



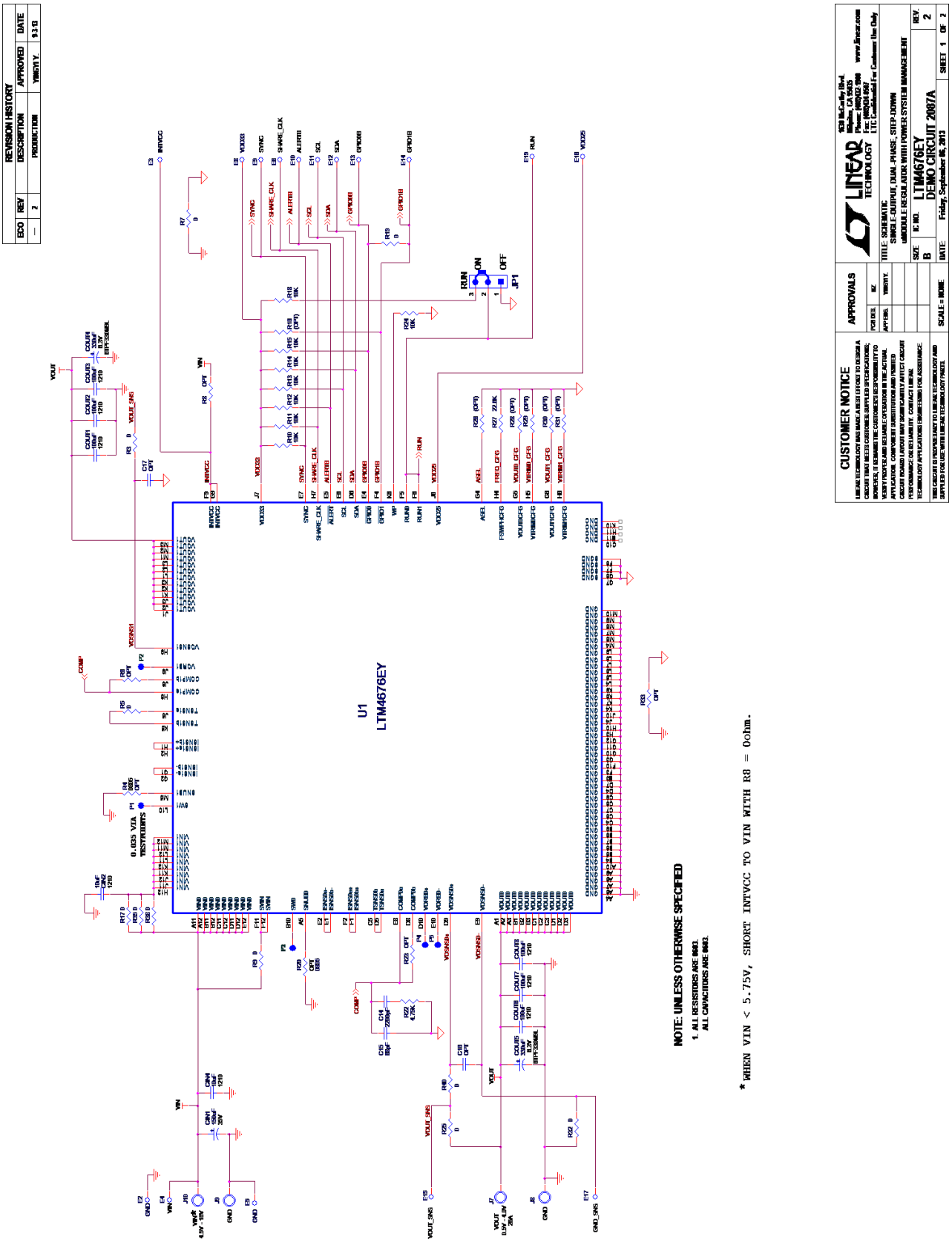
e. You can save the changes into the NVM. In the tool bar, click "RAM to NVM" button, as following

f. Save the demo board configuration to a (*.proj) file. Click the Save icon and save the file. Name it whatever you want.

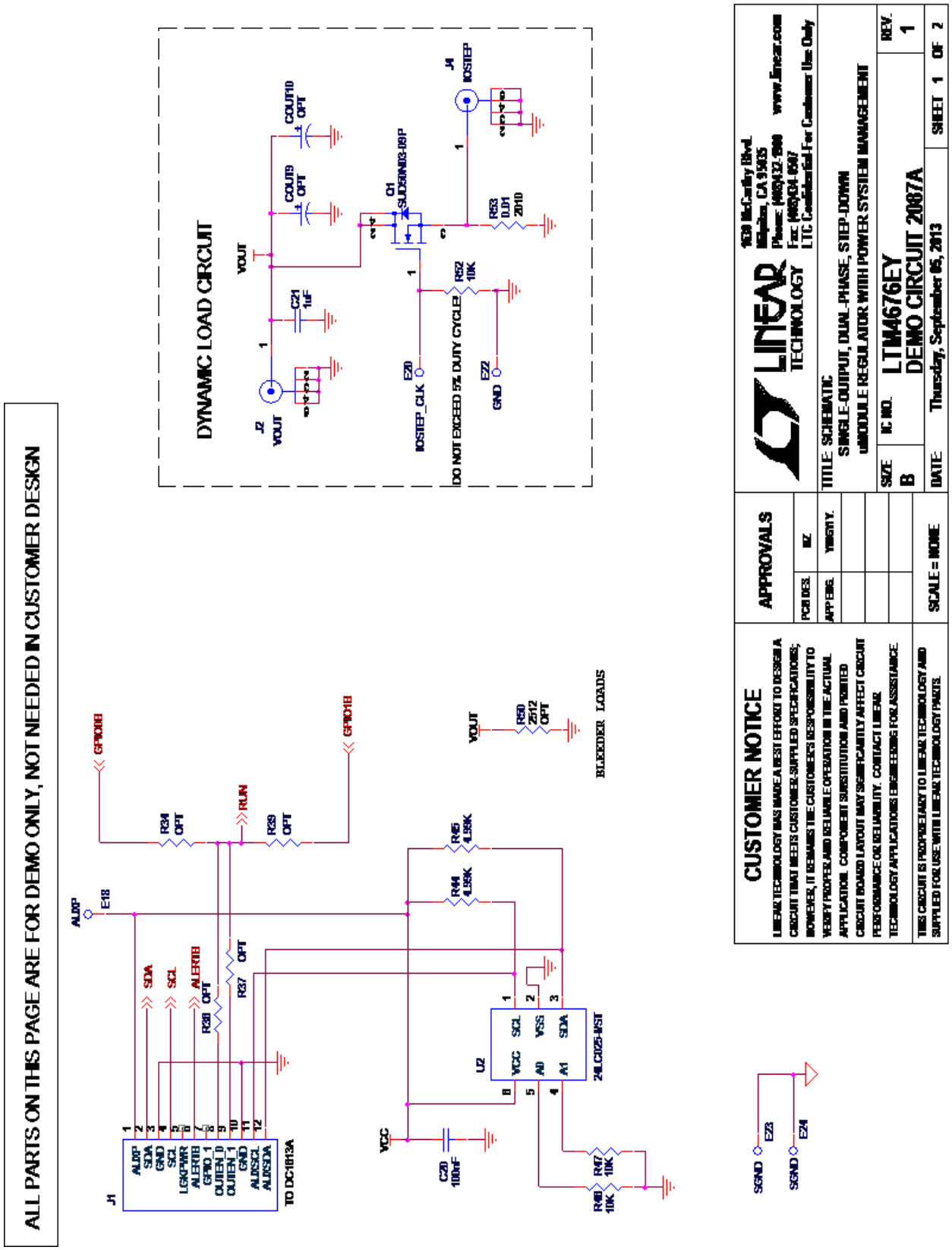
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CIN1	CAP., 150µF, 35V, ALUMINUM ELECTR.,	SUN ELECT., 35CE150AX
2	2	CIN2, CIN4,	CAP., X5R, 10µF, 35V, 10%,1210	MURATA, GRM32ER6YA106KA12
3	6	COUT1-COUT3, COUT6-COUT8	CAP., X5R, 100µF, 6.3V, 20% 1210	MURATA, GRM32ER60J107ME20L
4	2	COUT4, COUT5	CAP., 330µF, 6.3V, POSCAP,D3L	SANYO, 6TPF330M9L
5	1	C14	CAP., X7R, 2200pF, 25V, 10%, 0603	MURATA, GRM188R71E222KA01D
6	1	C15	CAP., X7R, 68pF, 25V, 10%, 0603	AVX., 06033A680KAT2A
7	1	C20	CAP., X5R, 0.1µF, 16V, 10%,0603	MURATA, GRM188R61C104KA01D
8	1	C21	CAP., X5R, 1µF, 25V,10%, 0603	MURATA, GRM188R61E105KA12D
9	1	JP1	HEADER 3 PIN 0.079 SINGLE ROW	SAMTEC, TMM103-02-L-S
10	2	J2, J4	CONN, BNC, 5PINS	CONNEX, 112404
11	1	J1	CONN HEADER 12POS 2MM STR DL PCB	FCI 98414-G06-12ULF
12	2	J9, J10	BANANA SMALL	KEYSTONE, 575-4
13	2	J7, J8	STUD, TEST PIN	PEM KFH-032-10
14	4	J7, J8 X2	NUT, BRASS 10-32	ANY, #10-32M/S BR PL
15	2	J7, J8	RING, LUG #10	KEYSTONE, 8205
16	2	J7, J8	WASHER, TIN PLATED BRASS	ANY, #10 EXT BZ TN
17	1	Q1	MOSFET, N-CH 40V 50A TO-252	VISHAY, SUD50N04-8M8P-4GE3
18	8	R3, R5, R7, R9, R19, R25, R32, R40	RES., CHIP, 0Ω, 1%, 0603	NIC, NRC06Z0TR
19	11	R10-R15, R18, R24, R46, R47, R52	RES., CHIP, 10k, 1%, 0603	NIC, NRC06F1002TRF
20	1	R27	RES., CHIP, 22.6k, 1%, 0603	VISHAY, CRCW060322K6FKEA
21	2	R44, R45	RES., CHIP, 4.99k, 1%, 0603	NIC, NRC06F4991TRF
22	1	R22	RES., CHIP, 4.75k, 1%, 0603	VISHAY, CRCW06034K75FKEA
23	3	R17, R35, R38	RES., CHIP, 0Ω, 0.5W, 1210	VISHAY, CRCW12100000Z0EF
24	1	R53	RES., CHIP, 0.01, 1/2W, 1%, 2010	VISHAY, WSL2010R0100FEA
25	1	U1	IC, LTM4676EY#PBF	LINEAR TECH. LTM4676EY#PBF
26	1	U2	IC, EEPROM 2KBIT 400KHZ SOT23-6	MICROCHIP, 24LC025T-E/OT
Additional Demo Board Circuit Components				
1	0	C16, C17, COUT9, COUT10 (OPT)	CAP., OPTIONAL	OPT
2	0	R4, R6, R8, R20, R23, R33, R34 (OPT)	RES., 0603	OPT
3	0	R36, R37, R39, R16, R26, R28-R31 (OPT)	RES., CHIP OPTIONAL	OPT
4	0	R50 (OPT)	RES., CHIP, 30Ω, 1%, 2512	OPT
Hardware-For Demo Board Only				
1	21	E2-E6, E8-E20, E22-E24	TESTPOINT, TURRET, 0.062"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	1	XJP1	SHUNT	SAMTEC, 2SN-BK-G
3	4	(STAND-OFF)	STAND-OFF, NYLON 0.50" tall	KEYSTONE, 8833 (SNAP ON)
4	1		FAB, PRINTED CIRCUIT BOARD	DEMO CIRCUIT 2087A

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



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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.

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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.

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