LTM4675EY
Dual Step-Down µModule Regulator with PMBus Power System Management

DESCRIPTION

Demonstration circuit 2053A is a dual-output, high efficiency, high density, µModule® regulator, operating from a 4.5V to 17V input range. Each output can supply 9A maximum load current. The demo board features the LTM4675 a dual 9A or single 18A step-down regulator with PMBus digital power system management. Please see the LTM®4675 data sheet for more detailed information.

The DC2053A powers up and regulates its outputs according to the LTM4675's factory-default EEPROM settings. Configuration resistors pin-straps can set device switching frequency and output voltage, if desired. Serial bus communication is not needed to configure or evaluate the LTM4675, facilitating quick set up and easy lab evaluation of the DC/DC converter. To fully explore the extensive DPSM features of the part, install 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 the module's EEPROM, view telemetry of voltage, current, temperature and fault status, and more.

GUI Download

The software can be downloaded from:
http://www.linear.com/ltpowerplay

For more details and instructions on LTpowerPlay, please refer to the LTpowerPlay GUI for LTM4675 Quick Start Guide.

Design files for this circuit board are available at http://www.linear.com/demo/DC2053A

BOARD PHOTO

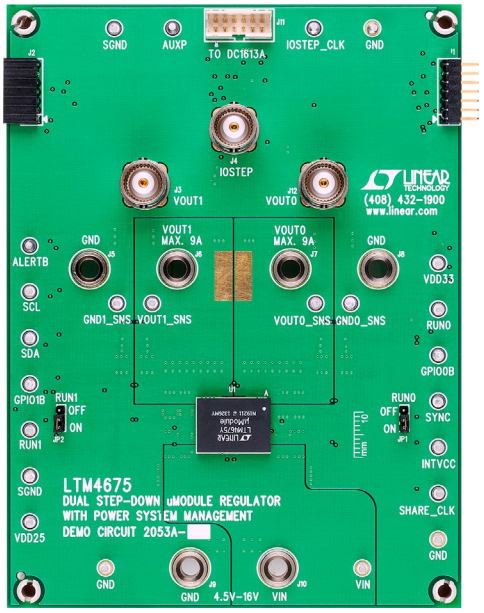


Figure 1. Dual-Output LTM4675/DC2053A Demo Circuit

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		4.5V to 17V
Output Voltage, V_{OUT0}	V_{IN} = 4.5V – 17V, I_{OUT0} = 0A to 9A	0.5V to 5.5V, Default: 1V
Maximum Output Current, I_{OUT0}	V_{IN} = 4.5V – 17V, V_{OUT} = 0.5V to 5.5V	9A
Output Voltage, V_{OUT1}	V_{IN} = 4.5V – 17V, I_{OUT1} = 0A to 9A	0.5V to 5.5V, Default: 1.8V
Maximum Output Current, I_{OUT1}	V_{IN} = 4.5V – 17V, V_{OUT} = 0.5V to 5.5V	9A
Typical Efficiency	V_{IN} = 12V, V_{OUT} = 1.8V, I_{OUT} = 9A	85.3%
Default Switching Frequency		500kHz

QUICK START PROCEDURE

Demonstration circuit 2053A is easy to set up to evaluate the performance of the LTM4675EY. 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 V_{IN} (4.5V to 17V) and GND (input return).
2. Connect the 1V output load between V_{OUT0} and GND (Initial load: no load).
3. Connect the 1.8V output load between V_{OUT1} and GND (Initial load: no load).
4. Connect the DVMs to the input and outputs. Set default jumper position: JP1: ON; JP2: ON.
5. Turn on the input power supply and check for the proper output voltages. V_{OUT0} should be 1V ±0.5%, and V_{OUT1} should be 1.8 ±0.5%.
6. 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.
7. Connect the dongle and control the output voltages from the GUI. See LTpowerPlay GUI for the LTM4675 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 DC2053A

You can use a LTpowerPlay on a PC to reconfigure the power management features of the LTM4675 such as: nominal VOUT, margin set points, OV/UV limits, temperature fault limits, sequencing parameters, the fault log, fault responses, GPIOs and more. The DC1613A dongle may be plugged when VIN is present.

QUICK START PROCEDURE

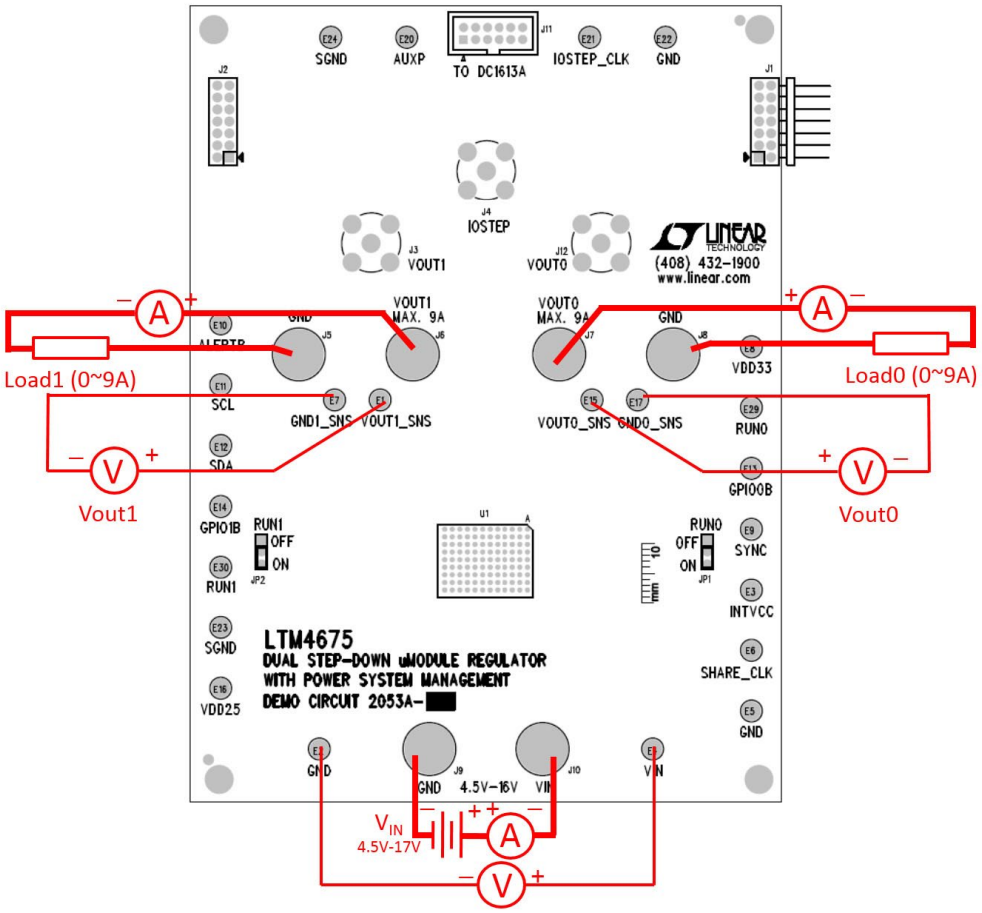


Figure 2. Proper Measurement Equipment Setup

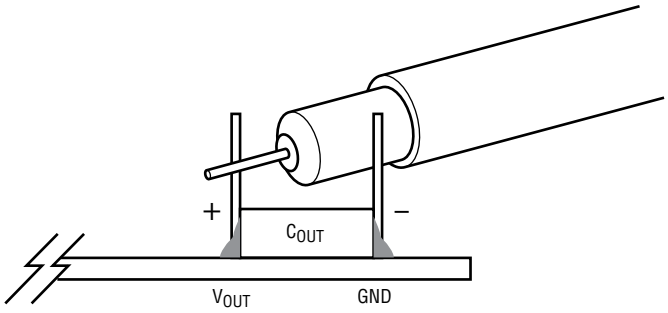


Figure 3. Measuring Output Voltage Ripple

QUICK START PROCEDURE

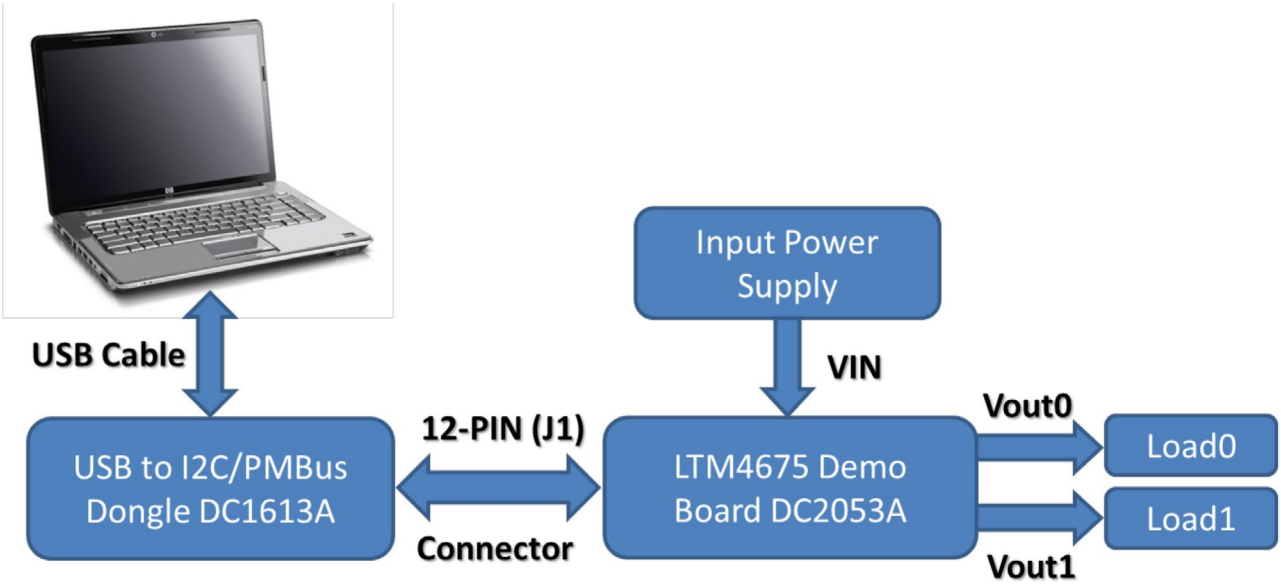


Figure 4. Demo Setup with PC

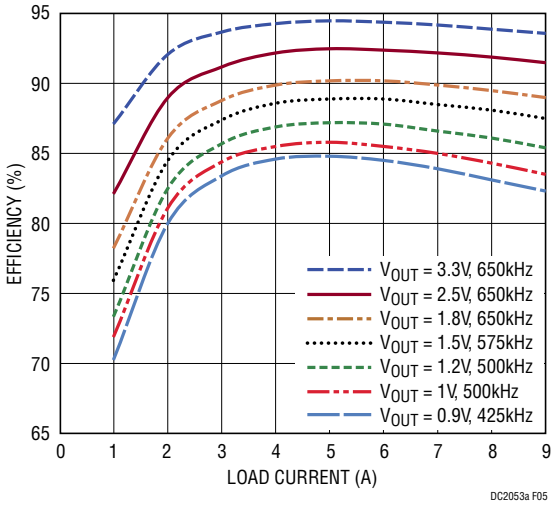


Figure 5. Efficiency vs Load Current at V_{IN} = 5V

QUICK START PROCEDURE

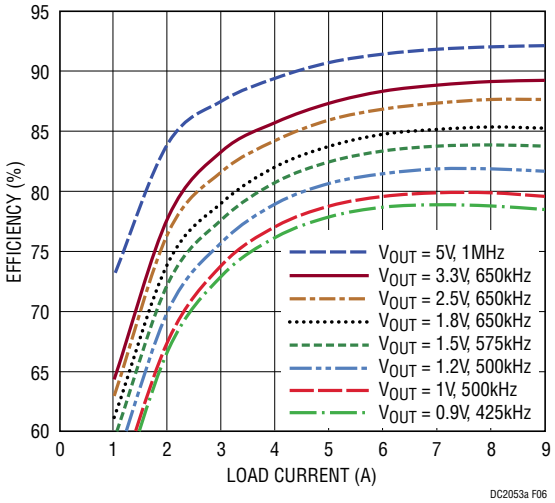


Figure 6. Efficiency vs Load Current at V_{IN} = 12V

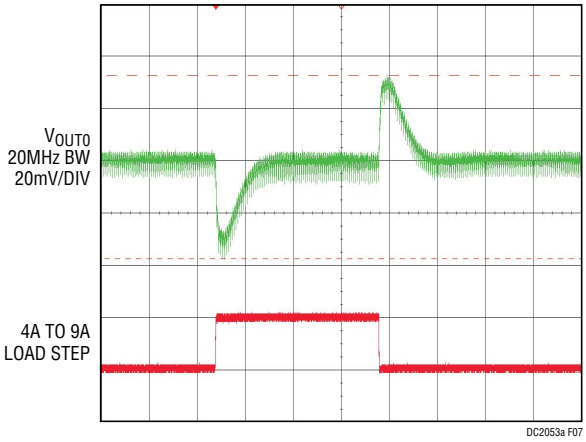


Figure 7. Output Voltage V_{OUT0} vs Load Current (V_{OUT0} RANGE = 0)

QUICK START PROCEDURE

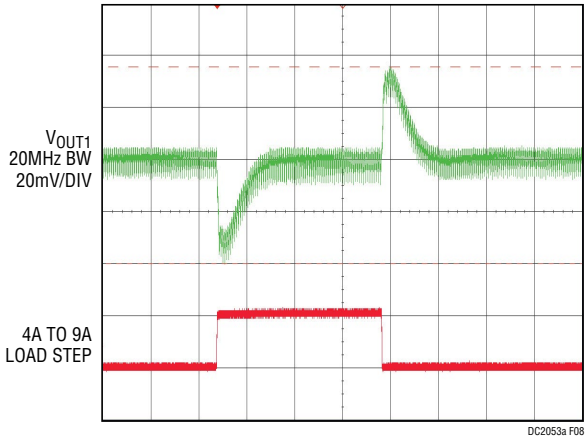


Figure 8. Output Voltage V_{OUT1} vs Load Current (V_{OUT1} RANGE = 0)

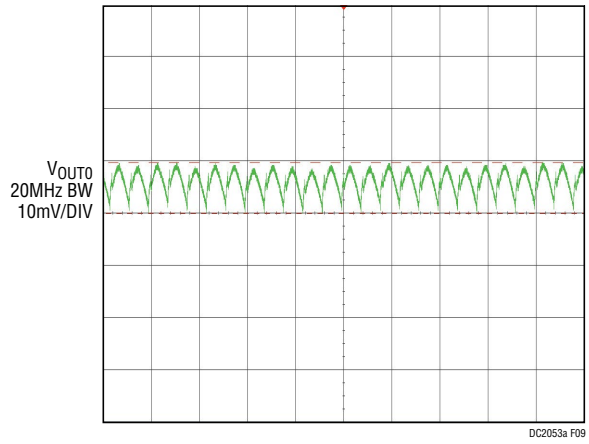


Figure 9. Output Voltage Ripple at V_{IN} = 12V, V_{OUT0} = 1V, I_{OUT0} = 9A

QUICK START PROCEDURE

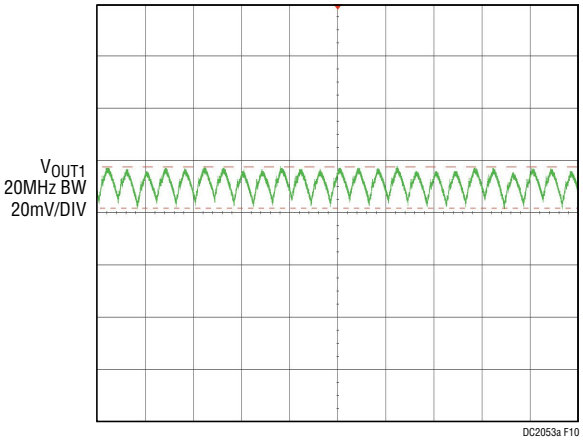


Figure 10. Output Voltage Ripple at V_{IN} = 12V, V_{OUT0} = 1.8V, I_{OUT0} = 9A

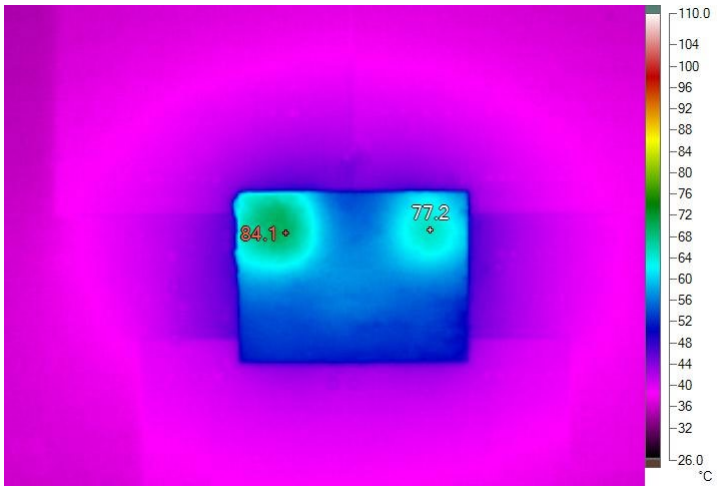


Figure 11. Thermal Performance at V_{IN} = 12V, V_{OUT0} = 1V, I_{OUT0} = 9A, V_{OUT1} = 1.8V, I_{OUT1} = 9A, T_A = 24°C, No Airflow

LTpowerPlay SOFTWARE GUI

LTpowerPlay is a powerful Windows based development environment that supports Linear Technology power system management ICs, including the LTM4675, LTC3880, 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 LTC PSM modules and ICs. The software also provides an automatic update feature to keep the software current with the latest set of device drivers and documentation. The LTpowerPlay software can be downloaded from:

http://linear.com/ltpowerplay

To access technical support documents for LTC Digital Power Products visit the LTpowerPlay Help menu. Online help also available through the LTpowerPlay.

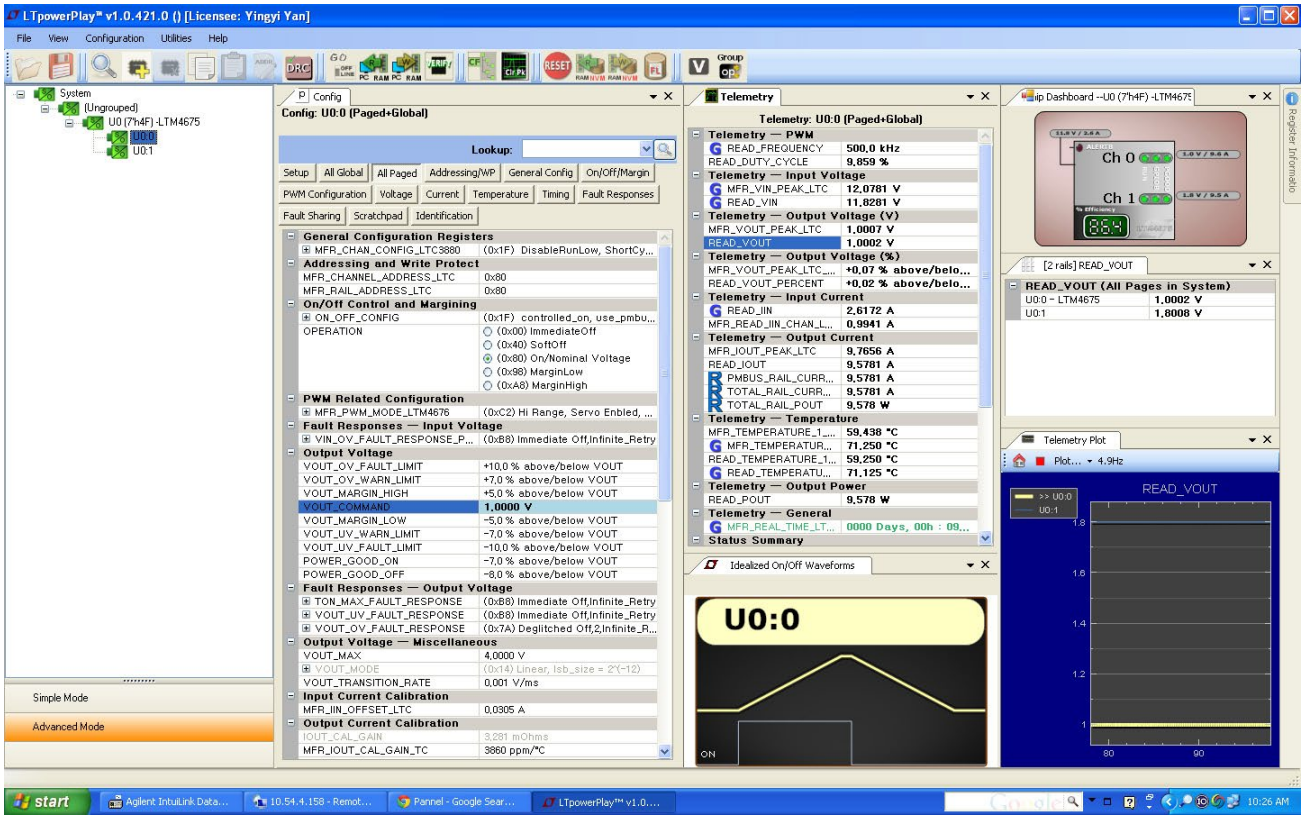


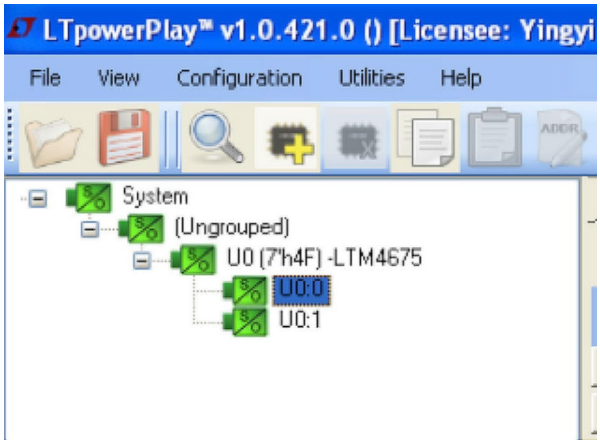
Figure 12. LTpowerPlay Main Interface

LTpowerPlay QUICK START PROCEDURE

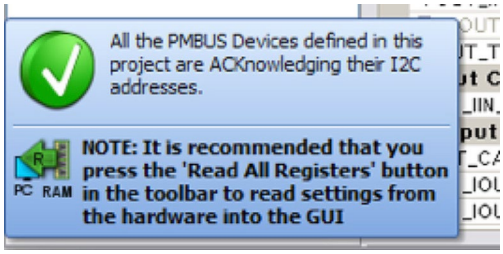
The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTM4675.

1. Download and install the LTpowerPlay GUI:
   http://linear.com/ltpowerplay
2. Launch the LTpowerPlay GUI.

   a. The GUI should automatically identify the DC2053A. The system tree on the left hand side should look like this:

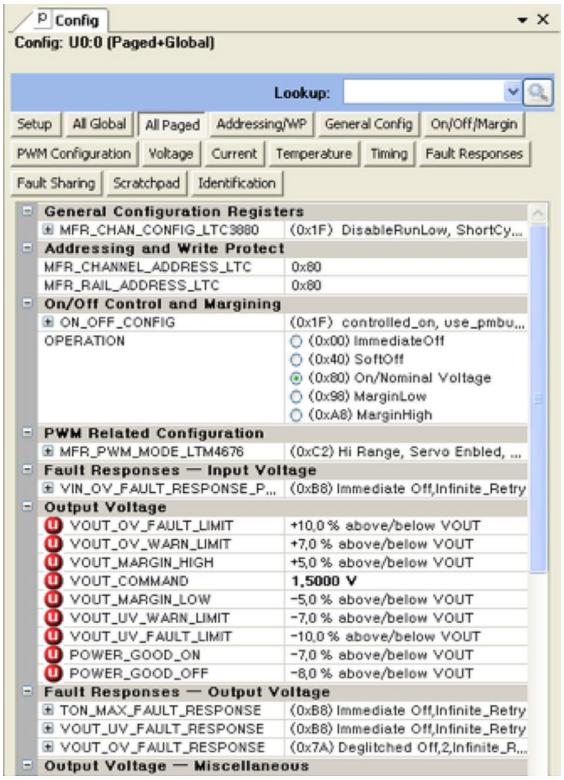


   b. A green message box shows for a few seconds in the lower left hand corner, confirming that LTM4675 is communicating:



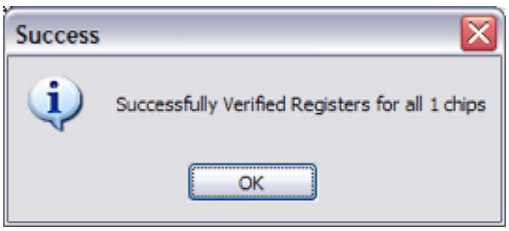
   c. In the Toolbar, click the R (RAM to PC) icon to read the RAM from the TM4675. This reads the configuration from the RAM of LTM4675 and loads it into the GUI.

   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, and strike the enter key, as shown:



   Then, click the W (PC to RAM) icon to write these register values to the LTM4675. 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:



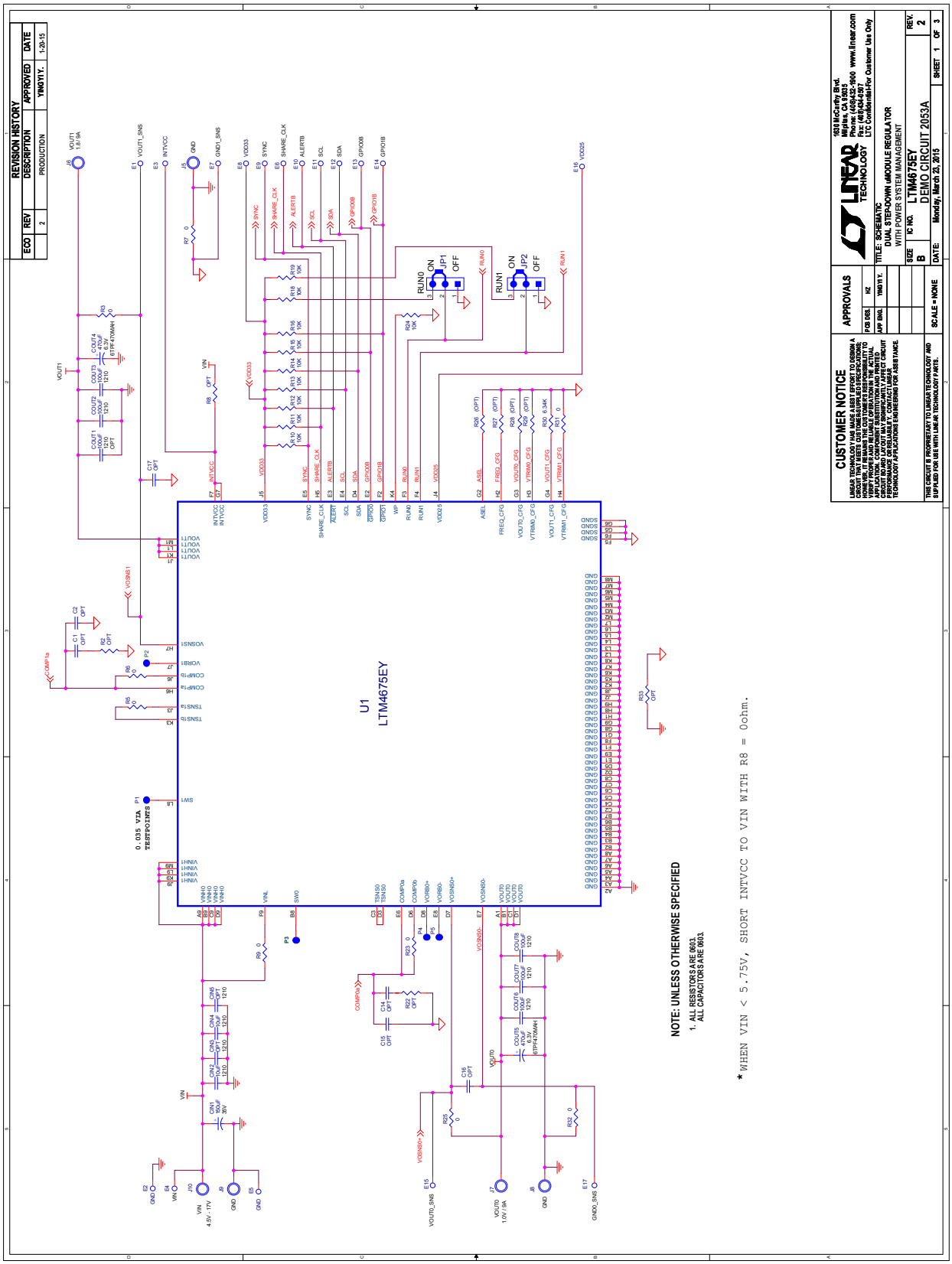
   e. You can save the changes into the NVM. In the tool bar, click RAM to NVM button, as following

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

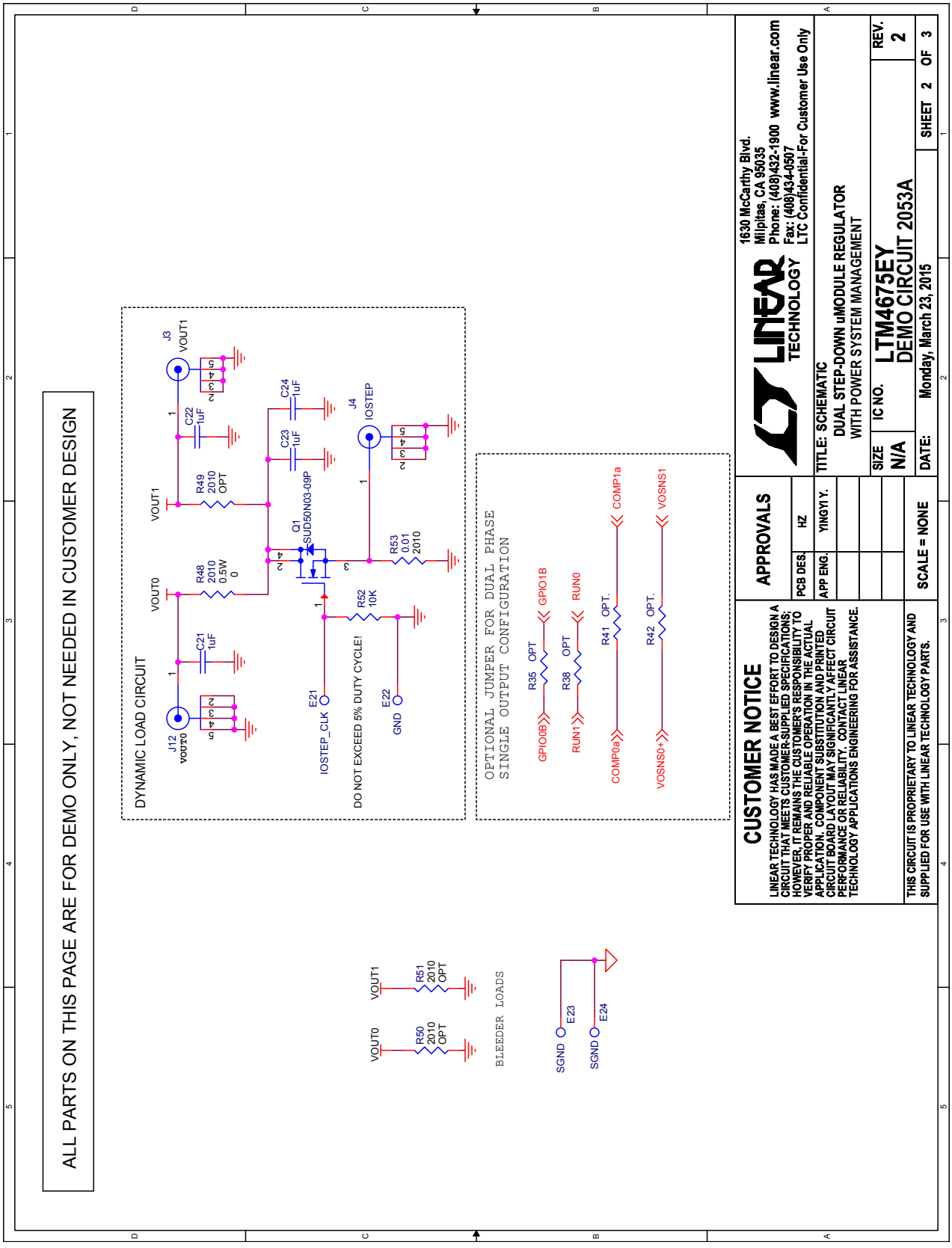
PARTS LIST

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 TO COUT3, COUT6 TO COUT8	CAP, X5R, 100µF, 6.3V, 20% 1210	AVX, 12106D107MAT2A
4	2	COUT4, COUT5	CAP, 470µF, 6.3V, POSCAP, D4	SANYO, 6TPF470MAH
5	2	C27, C28	CAP, X5R, 10nF, 25V,10%, 0603	AVX , 06033D103KAT2A
6	3	C21, C22, C24	CAP, X5R, 1µF, 25V,10%, 0603	YAGEO, CC0603KRX5R8BB105
7	1	C23	CAP, X7R, 1µF, 25V,10%, 0805	TAIYO, YUDEN,TDK212BJ105KD-T
8	1	C26	CAP, X5R, 100nF, 25V,10%, 0603	AVX , 06033D104KAT2A
9	2	JP1, JP2	HEADER 3 PIN 0.079 SINGLE ROW	SAMTEC, TMM103-02-L-S
10	1	J1	CONN HEADER 14POS 2MM R/A GOLD	MOLEX, 87760-1416
11	1	J2	CONN RECEPT 2MM DUAL R/A 14POS	SULLINS, NPPN072FJFN-RC
12	3	J3, J4, J12	CONN, BNC, 5PINS	CONNEX, 112404
13	1	J11	CONN HEADER 12POS 2MM STR DL PCB	FCI 98414-G06-12ULF
14	6	J5 TO J10	BANANA SMALL	KEYSTONE, 575-4
15	1	Q1	N-CHANNEL 30-V MOSFET	VISHAY, SUD50N03-09P
16	1	Q19	MOSFET P-CH 30V 3.5A SOT-23	DIODES, DMP3130L-7
17	12	R3, R5 TO R7, R9, R23, R25, R31, R32, R63, R65, R66	RES, CHIP, 0, 1%, 0603	VISHAY, CRCW06030000Z0EA
18	12	R10 TO R16, R18, R19, R24, R52, R77	RES, CHIP, 10k, 1%, 0603	VISHAY, CRCW060310K0FKEA
19	1	R30	RES, CHIP, 6.34k, 1%, 0603	VISHAY, CRCW06036K34FKEA
20	2	R72, R73	RES, CHIP, 4.99k, 1%, 0603	VISHAY, CRCW06034K99FKEA
21	1	R48	RES, CHIP, 0, 0.5W, 2010	NIC, NRC50ZOTRF
22	1	R53	RES, CHIP, 0.01, 1/2W, 1%, 2010	IRC, LRF2010LF-01-R010-F
23	2	R69, R70	RES, CHIP, 10, 1%, 0603	VISHAY, CRCW060310R0FKEA
24	1	R78	RES, CHIP, 15.8k, 1%, 0603	VISHAY, CRCW060315K8FKEA
25	1	U1	IC, LTM4675EY#PBF	LINEAR TECHNOLOGY LTM4675EY#PBF
26	1	U3	IC, 24LC025-1/ST TSSOP	MICROCHIP, 24LC025-1/ST
Additional Demo Board Circuit Components				
1	0	CIN3, CIN5 (OPT)	CAP, 1210	
2	0	C1, C2, C14 TO C17 (OPT)	CAP, 0603	
3	0	D1, D2 (OPT)	DIODE	
4	0	R2, R8, R22, R26 TO R29, R33, R35, R38, R41, R49 (OPT)	RES, OPTIONAL	
5		R61, R62, R64, R67, R68, R74, R75, R82, R83, R88		
6	0	R50, R51 (OPT)	RES, CHIP, 30, 1%, 2512	
Hardware: For Demo Board Only				
1	24	E1 TO E17, E20 TO E24, E29, E30	TESTPOINT, TURRET, 0.062"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	2	XJP1, XJP2	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 2053A

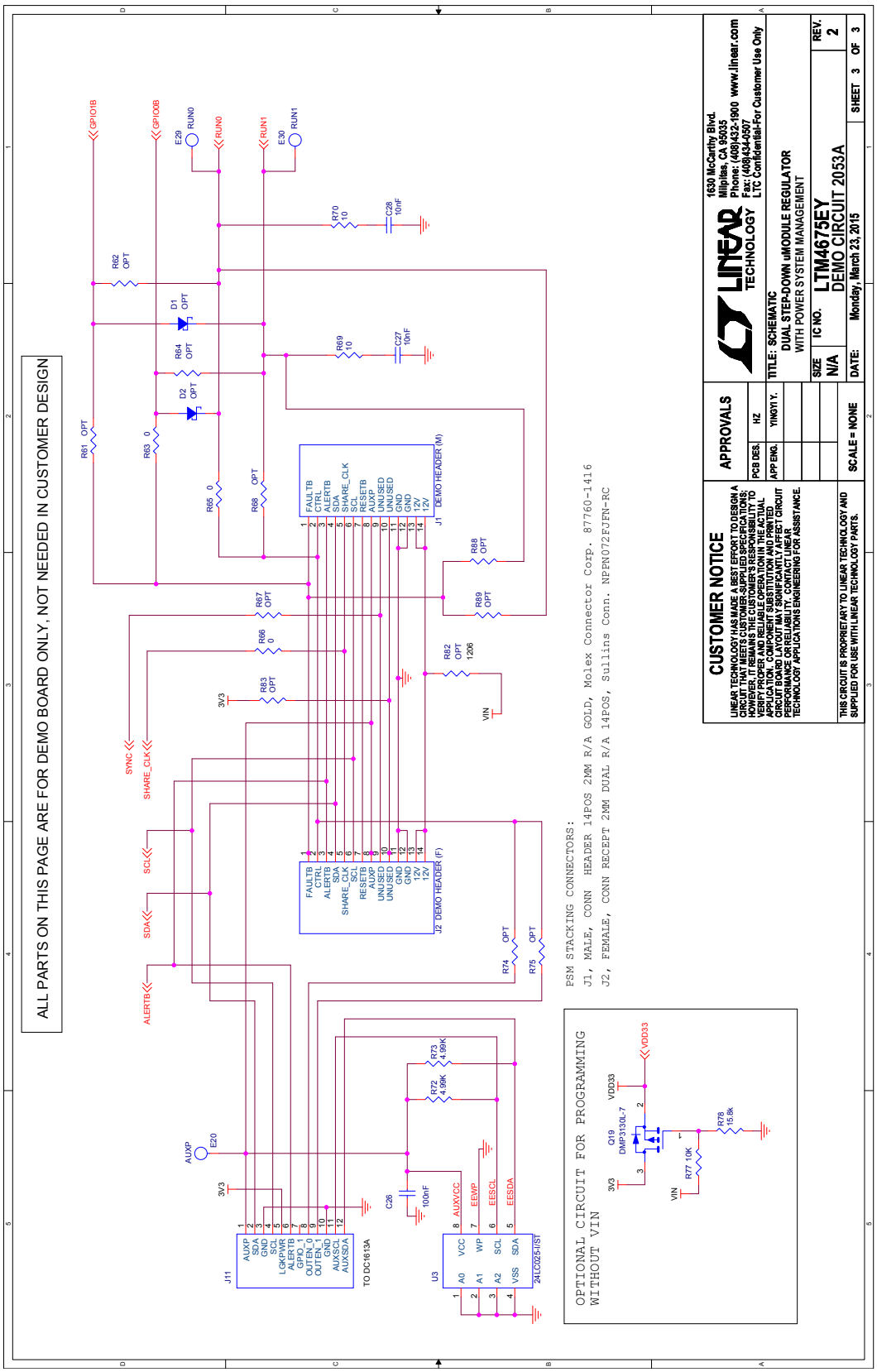
SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



DEMONSTRATION BOARD IMPORTANT NOTICE

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This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

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.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

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LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

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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