

LTC3880EUJ LTC3870EUFD

Poly-Phase Step-Down DC/DC Controller with Power System Management

DESCRIPTION

Demonstration circuit 2089A is a high current, high efficiency, poly-phase synchronous buck converter featuring the LTC[®]3880EUJ, a dual-phase current mode controller, and the LTC3870EUFD, a dual-phase slave controller. The LTC3880 has the PMBus interface and power system management functions.

The DC2089A uses discrete MOSFETs as the power stage. The input range of this board is from 7V to 14V, and the output voltage can be programmed from 0.8V to 1.8V. The output current is up to 80A for 4-phase operation. The DC2089A has two versions, the DC2089A-A uses a current sense resistor, while the DC2089A-B has DCR current sensing. The factory default setting for the output voltage is 1.0V. The DC2089A also has an on-board dynamic load circuit, which makes it easy for the customer to evaluate the transient performances.

The DC2089A powers up to default settings and produces power based on configuration resistors or NVM without the need for any serial bus communication. This allows

easy evaluation of the DC-DC converter aspects of the LTC3880. To fully explore the extensive power system management features of the parts, 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 for LTC3880 Quick Start Guide".

Design files for this circuit board are available at
<http://www.linear.com/demo/DC2089A>

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PERFORMANCE SUMMARY Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
DC2089A-A Assembly (R_{SENSE} Current Sense)						
V _{IN}	Input Supply Range		7	12	14	V
V _{OUT0}	Output Voltage Range	I _{OUT} = 0A TO 80A, V _{IN} = 7.0V to 14V	0.8	1.0	1.8	V
I _{OUT0}	Output Current Range		0		80	A
FSW	Factory Default Switching			350		kHz
EFF	Peak Efficiency	V _{OUT} = 1.0V, See Figure 4.		88.8		%
DC2089A-B Assembly (DCR Current Sense)						
V _{IN}	Input Supply Range		7	12	14	V
V _{OUT0}	Output Voltage Range	I _{OUT} = 0A TO 80A, V _{IN} = 7.0V to 14V	0.8	1.0	1.8	V
I _{OUT0}	Output Current Range		0		80	A
FSW	Factory Default Switching			350		kHz
EFF	Peak Efficiency	V _{OUT} = 1.0V, See Figure 5.		88.2		%

QUICK START PROCEDURE

Demonstration circuit 2089A makes it easy to set up to evaluate the performances of the LTC3880 and the slave controller LTC3870. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip directly across the C28. See Figure 3 for proper scope probe technique.

1. Make sure jumpers are in the following positions:

JUMPER	POSITION	FUNCTION
JP1	OFF	Power supply for pulse generator
JP3	C	GPIO0B to GPIO1B
JP4	C	RUN0 to Run1
JP5	EXT	External/Internal pulse for load transient circuit

2. With power off, connect the input power supply to V_{IN} and GND. Connect active load to the output.
3. Make sure both RUN switches (SW1, SW2) are OFF.

4. Turn on the power at the input.

NOTE: Make sure that the input voltage does not exceed 16V.

5. Turn on both RUN switches as desired.

6. Check for the correct output voltage from E5 to E6.
 $V_{OUT} = 1.0V \pm 0.5\%$ (1.005V ~ 0.995V)

NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

7. Once the proper output voltage is established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

8. Connect the dongle and control the output voltage from the GUI. See “LTpowerPlay QUICK START” session for details.

Connecting a PC to DC2088A

You can use a PC to reconfigure the power management features of the LTC3880 such as: nominal V_{OUT} , margin set points, OV/UV limits, temperature fault limits, sequencing parameters, the fault log, fault responses, GPIO and other functionality. The DC1613A dongle may be plugged in regardless of whether or not V_{IN} is present. Dongle can be hot plugged.

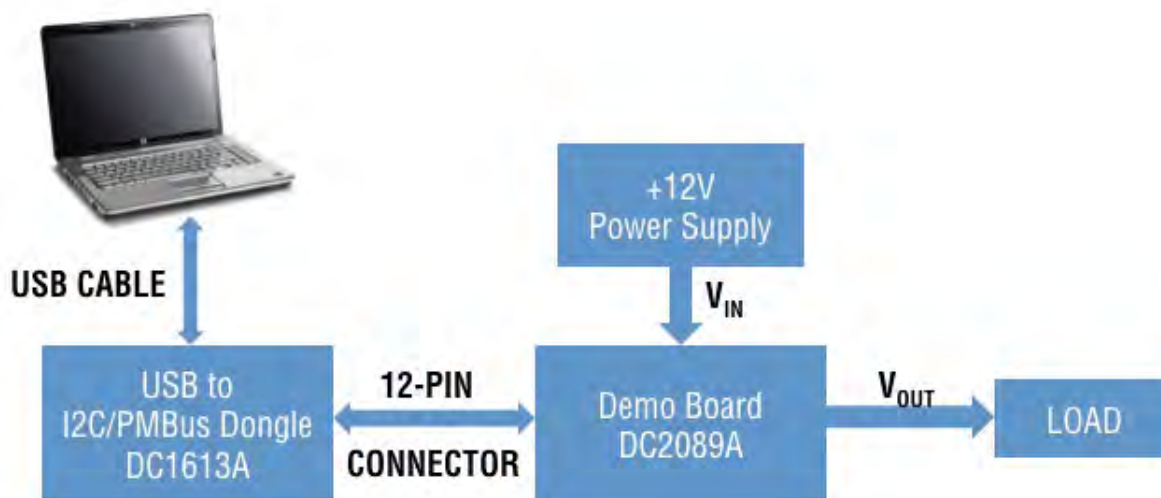


Figure 1. Demo Setup with PC

QUICK START PROCEDURE

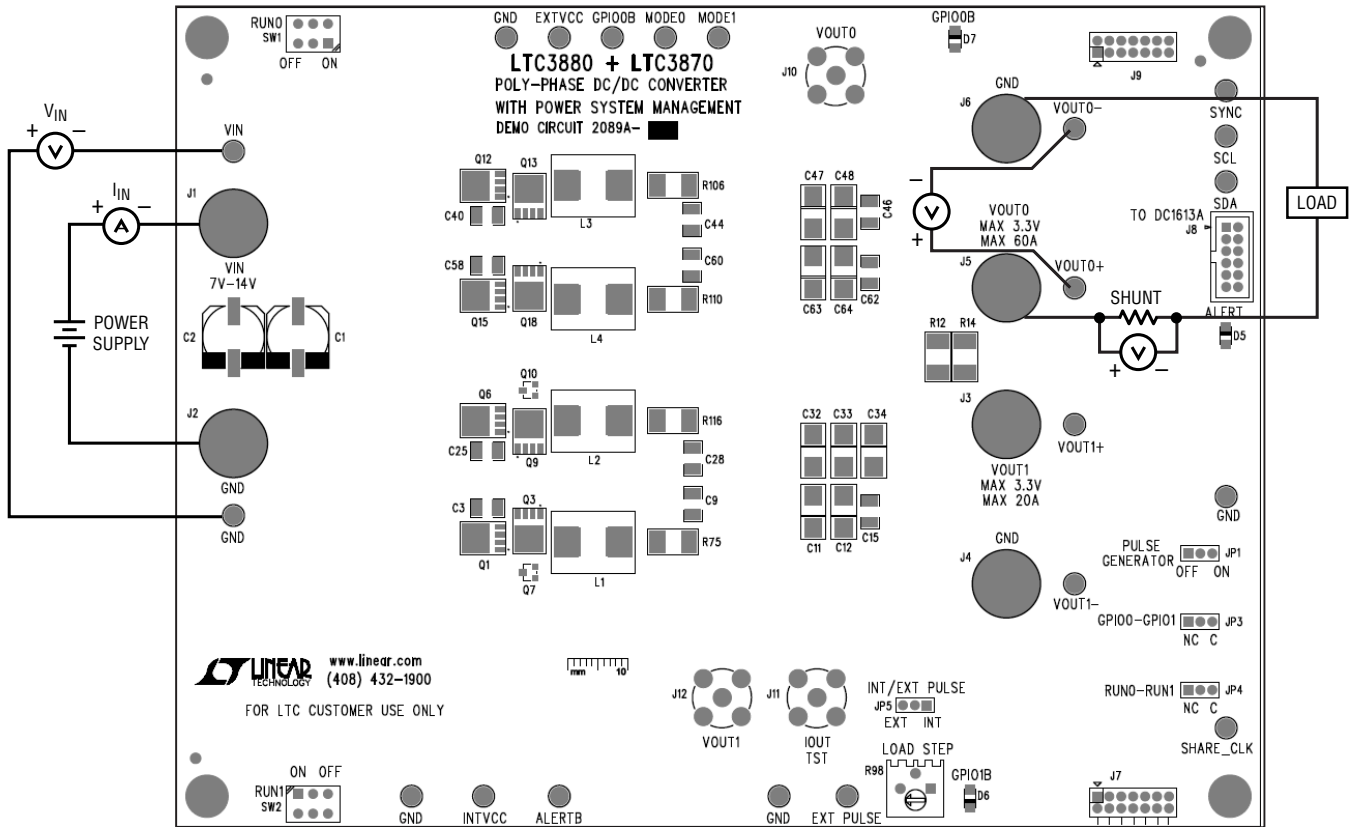


Figure 2. Power Test Setup

QUICK START PROCEDURE

Measuring Efficiency

To accurately measure efficiency of any configuration, do the following:

- Set JP1 to OFF position to disable the auxiliary circuits.
- Measure V_{IN} across the input ceramic capacitor (C25). Measure V_{OUT} across the output ceramic capacitor (C28).

Measuring Output Ripple Voltage

An accurate ripple measurement may be performed by using the below configuration across C28.

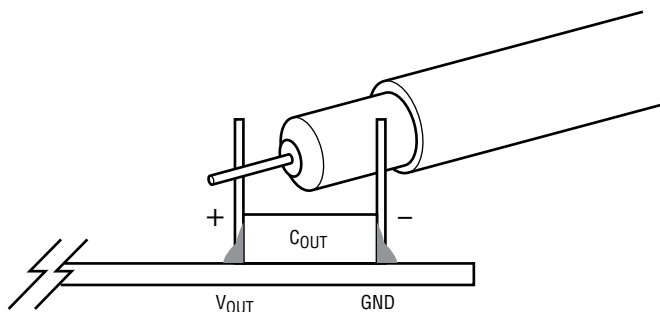


Figure 3. Measuring Output Voltage Ripple

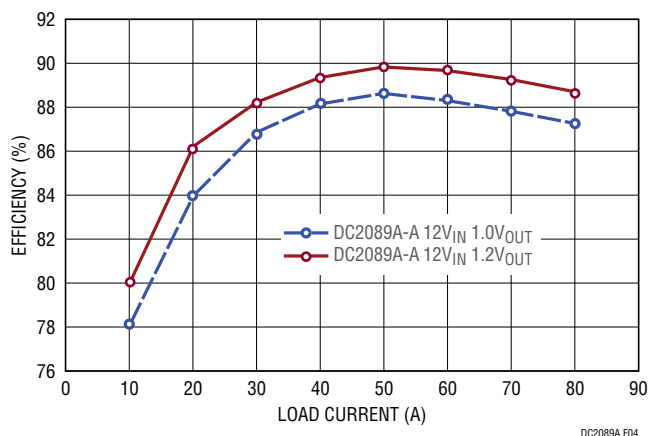


Figure 4. Typical Efficiency Curves DC2089A-A, $F_{SW} = 350kHz$

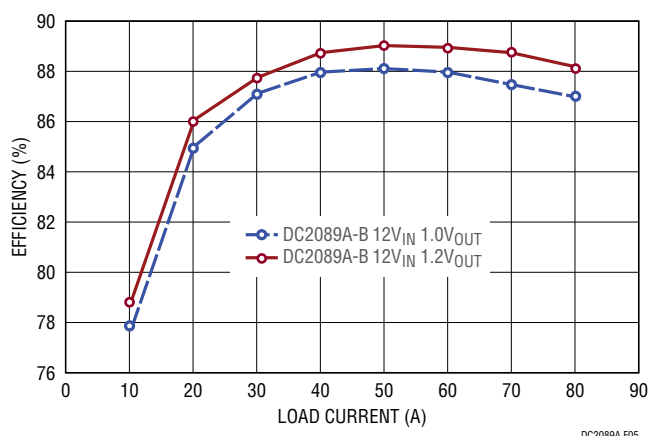


Figure 5. Typical Efficiency Curves DC2089A-B, $F_{SW} = 350kHz$

LTpowerPlay SOFTWARE GUI

LTpowerPlay is a powerful Windows based development environment that supports Linear Technology® power system management ICs, including the 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 one of many potential targets, including the LTC3880’s DC2089A 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 software 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.

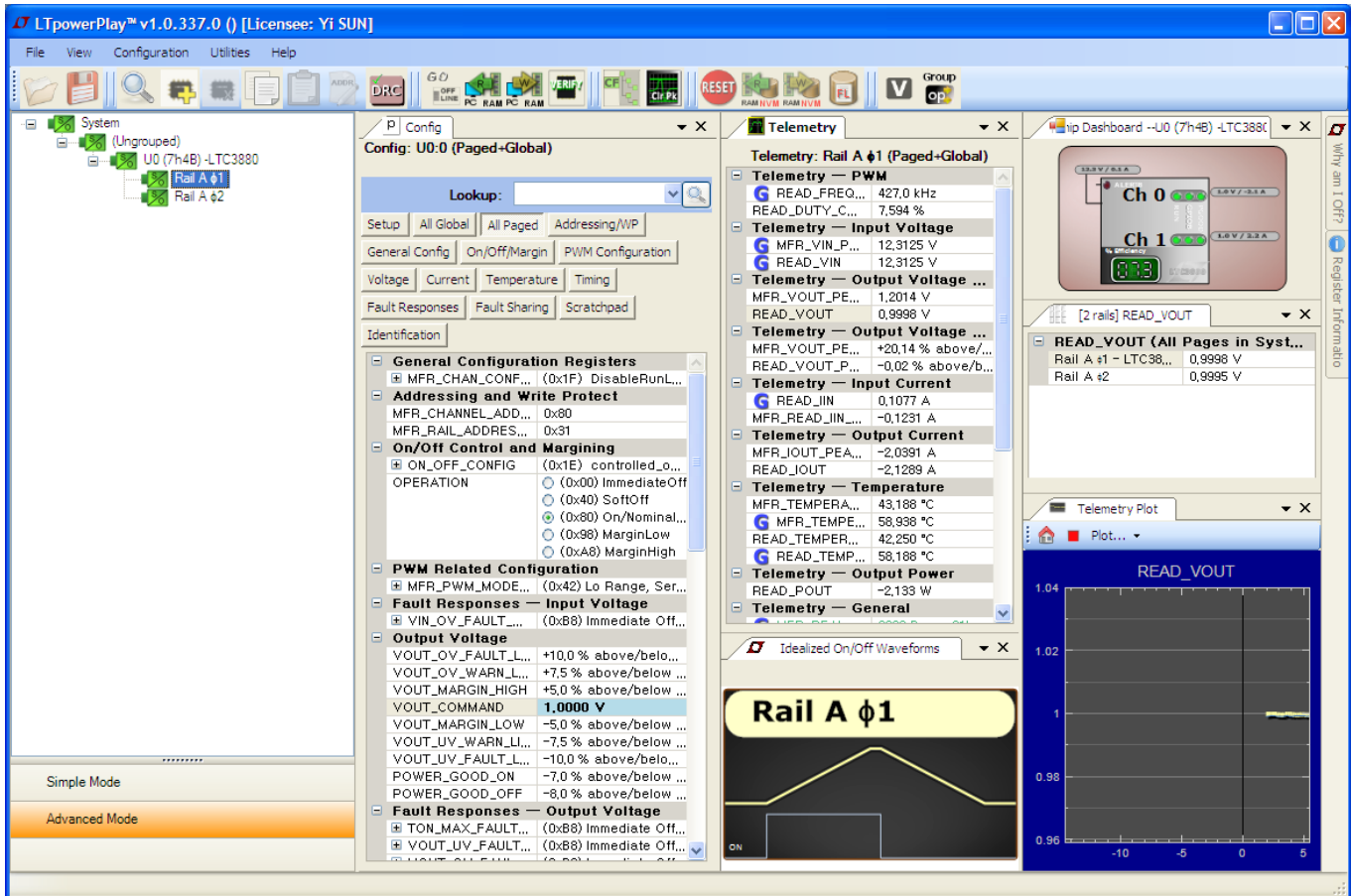


Figure 6. LTpowerPlay Main Interface

DEMO MANUAL

DC2089A-A/DC2089A-B

LTpowerPlay QUICK START PROCEDURE

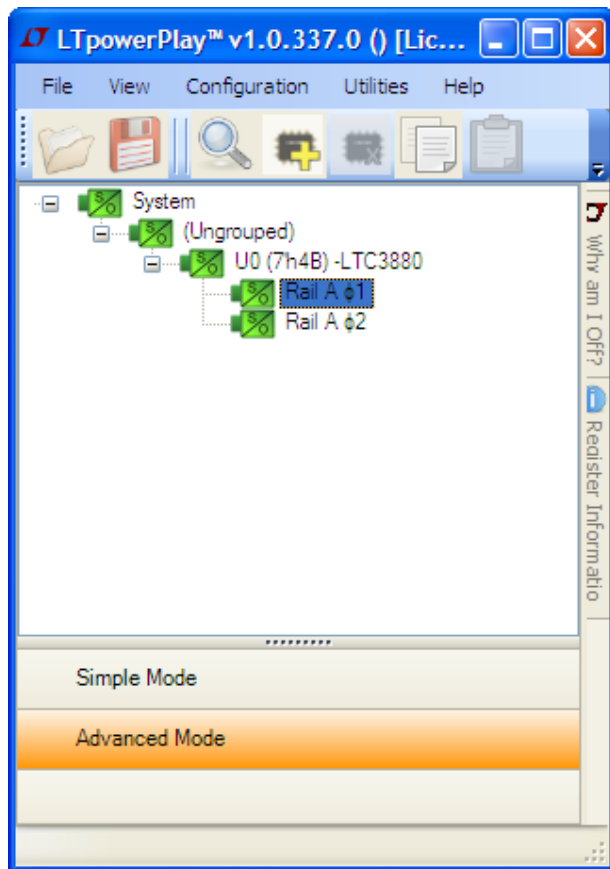
The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTC3880.

1. Download and install the LTPowerPlay GUI:

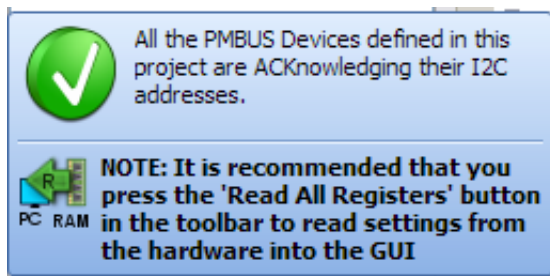
<http://www.linear.com/ltpowerplay>

2. Launch the LTpowerPlay GUI.

- a. The GUI should automatically identify the DC2089A. The system tree on the left hand side should look like this:



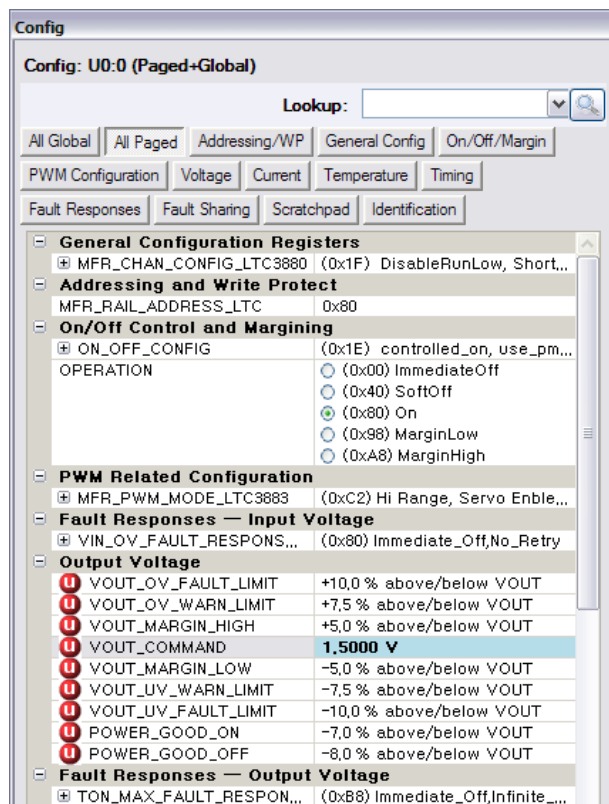
- b. A green message box shows for a few seconds in the lower left hand corner, confirming that the LTC3880 is communicating:



- c. In the Toolbar, click the “R” (RAM to PC) icon to read the RAM from the LTC3880. This reads the configuration from the RAM of LTC3880 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 LTC3880. After finishing this step, you will see the output voltage will change to 1.5V.



LTpowerPlay QUICK START PROCEDURE

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
DC2089A-A Required Circuit Components				
1	2	C1, C2	CAP., OS-CON, 330µF, 16V, 20%, F12	SANYO, 16SVP330M
2	8	C3, C4, C24, C25, C40, C41, C58, C59	CAP., X5R, 10µF, 16V, 10%, 1210	TAIYO YUDEN EMK325BJ106KN
3	6	C5, C18, C26, C42, C53, C57, C70	CAP., X5R, 100nF, 25V, 10%, 0603	AVX 06033C104KAT2A
4	3	C6, C39, C43	CAP., X5R, 4.7µF, 16V, 10%, 0603	TDK C1608X5R1C475K
5	2	C7, C8	CAP., X5R, 1µF, 25V, 10%, 0603	AVX 06033D105KAT2A
6	14	C9, C10, C15, C16, C28, C29, C44, C45, C46, C49, C60, C61, C62, C65	CAP., X5R, 100µF, 6.3V, 10%, 1210	AVX 12106D107AT2A
7	12	C11, C12, C30, C31, C32, C33, C34, C35, C47, C48, C63, C64	CAP, POSCAP 330µF 4V D3L	SANYO, 4TPF330ML
8	2	C22, C23	CAP., X7R, 100pF, 25V, 10%, 0603	AVX 06033C101KAT2A
9	2	C27, C36	CAP., X5R, 10nF, 16V, 10%, 0603	AVX 0603YC103KAT2A
10	2	C54, C56	CAP., NPO, 47pF, 50V, 5%, 0603	AVX 06035A470JAT2A
11	4	C19, C38, C55, C68	CAP., X5R 1000pF, 50V 5% 0603	AVX, 06035C102JAT2A
12	1	C21	CAP., X5R, 1500pF, 25V, 10%, 0603	NIC NMC0603X7R152K50TRPF
13	4	L1, L2, L3, L4	INDUCTOR, POWER, 0.25µH	WURTH ELEC., 744301025
14	4	D1, D2, D3, D4	DIODE, SCHOTTKY, SOD-323	CENTRAL CMDSH-3TR
15	4	Q1, Q6, Q12, Q15	XSTR, POWER MOSFET LFPAK	INFINEON BSC050NE3LS G
16	4	Q3, Q9, Q13, Q18	XSTR, POWER MOSFET LFPAK	INFINEON BSC010NE2LSI
17	2	Q7, Q10	TRANS GP SS PNP 40V SOT-23	ON SEMI, MMBT3906LT1G
18	2	R1, R40	RES., CHIP, 2Ω, 1%, 0603	YAGEO, RC0603FR-072RL
19	8	R2, R3, R4, R5, R20, R27, R31, R122, R123	RES., CHIP, 10k, 1% 0603	NIC NRC06F1002TRF
20	33	R8, R17, R18, R24, R26, R37, R39, R41, R42, R45, R46, R47, R48, R49, R50, R52, R56, R57, R60, R62, R85, R124–R127, R74, R105, R109, R115, R103, R108, R112, R118	RES., CHIP, 0Ω, 1% 0603	VISHAY, CRCW06030000Z0EA
21	4	R12, R13, R14, R15	RES SENSE., CHIP, 0, 1W 2512	VISHAY WSL25120000ZEA9
22	1	R25	RES., CHIP, 7.32k, 1% 0603	NIC NRC06F7321TRF
23	1	R28	RES., CHIP, 16.2k, 1% 0603	NIC NRC06F1622TRF
24	1	R29	RES., CHIP, 17.4k, 1% 0603	NIC NRC06F1742TRF

DEMO MANUAL

DC2089A-A/DC2089A-B

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
25	2	R33, R35	RES., CHIP, 5.76k, 1%, 0603	NIC NRC06F5761TRF
26	1	R51	RES., CHIP, 90.9k, 1% 0603	NIC NRC06F9092TRF
27	1	R3	RES., CHIP, 4.99k, 1% 0603	VISHAY CRCW06034K99FKEA
28	1	R16	RES., CHIP, 3.48k, 1%, 0603	NIC NRC06F3481TRF
29	8	R65, R66, R68, R104, R102, R107, R111, R117	RES., CHIP, 100 , 1% 0603	VISHAY, CRCW0603100RFKEA
30	4	R75, R106, R110, R116,	RES SENSE, 0.001 2512	VISHAY WSL25121L000FEA
31	1	U1	IC, LTC3880EUJ, QFN40P 6mm x 6mm	LTC., LTC3880EUJ
32	1	U2	IC, LTC3870EUJ, QFN28P 4mm x 5mm	LTC., LTC3870EUJ

DC2089A-A Additional Circuit Components

1	1	C70	CAP., X5R, 100nF,25V, 10% 0603	AVX 06033C104KAT2A
2	1	C73	CAP., X5R, 4.7µF,16V, 10% 0603	TDK C1608X5R1C475K
3	0	C13, C14, C50, C51, C66, C67	CAP, POSCAP OPT D3L	
4	0	C20	CAP, OPT,0603	
5	2	C71, C72	CAP., X5R, 10nF,16V, 10% 0603	AVX 0603YC103KAT2A
6	3	C74, C78, C79	CAP., X5R, 1µF, 16V, 10% 1206	AVX 1206YD105KAT2A
7	2	C77, C82	CAP., X5R, 2.2µF,50V, 10% 0805	MURATA GRM21BR61H225KA73L
8	1	C80	CAP., NPO, 150pF, 6.3V 0603	AVX 06036A151JAT2A
9	1	C81	CAP., X7R, 1µF, 16V, 10% 0805	MURATA GRM21BR71C105KA01L
10	1	D5	LED RED S-GW TYPE SMD	ROHM SML-0110VTT86
11	2	D6, D7	LED GREEN S-GW TYPE SMD	ROHM SML-010FTT86L
12	0	D8, D9	LED OPT SOD-323	OPT
13	0	Q2, Q4, Q5, Q8, Q11, Q14, Q16, Q17	XSTR, OPT LFPK	OPT
14	2	Q19, Q20	MOSFET P-CH 20V 0.58A SOT-23	VISHAY TP0101K-T1-E3
15	2	Q21, Q22	MOSFET N-CH 60V 115MA SOT-23	FAIRCHILD 2N7002A
16	1	Q23	MOSFET SPEED SRS 30V 30ALFPK	RENESAS, RJK0305DPB-00#J0
17	1	R88	RES., CHIP, 2Ω, 1% 0603	YAGEO, RC0603FR-072RL
18	2	R71, R93	RES., CHIP, 10k, 1% 0603	NIC NRC06F1002TRF
19	3	R64, R67, R70	RES., CHIP, 0Ω, 1% 0603	VISHAY, CRCW06030000Z0EA
20	0	R9, R11, R19, R30, R36, R38, R55, R58, R59, R61, R63, R69, R80, R81, R100, R101, R113, R114, R119, R120, R122, R6, R21, R43, R53, R7, R22, R44, R54	RES., OPT 0603	OPT
21	1	R72	RES., CHIP, 127Ω, 1% 0603	NIC NRC06F1270TRF
22	1	R73	RES., CHIP, 15.8k, 1% 0603	NIC NRC06F1582TRF
23	3	R76, R77, R96	RES., CHIP, 10Ω, 1% 0603	NIC NRC06F10R0TRF
24	2	R78, R79	RES., CHIP, 200Ω, 1% 0603	NIC NRC06F2000TRF
25	2	R82, R83	RES., CHIP, 4.99k, 1% 0603	VISHAY CRCW06034K99FKEA
26	1	R84	RES., CHIP, 100k, 1% 0603	NIC NRC06F1003TRF
27	1	R86	RES., CHIP, 0.001Ω, 1%, 1W 2010	NIC NCSR150FR001DTR
28	0	R87	RES., CHIP, OPT 2010	OPT
29	2	R89, R95	RES., CHIP, 20k, 1% 0603	NIC NRC06F2002TRF
30	1	R90	RES., CHIP, 154k, 1% 0603	NIC NRC06F1543TRF

DEMO MANUAL

DC2089A-A/DC2089A-B

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
31	1	R91	RES., CHIP, 1M, 5% 0603	VISHAY CRCW06031M00JNEA
32	1	R92	RES., CHIP, 3.3Ω, 1% 0603	VISHAY CRCW06033R30FKEA
33	1	R94	RES., CHIP, 82.5Ω, 5% 0603	VISHAY CRCW060382R5FKEA
34	1	R97	RES., CHIP, 681k, 1% 0603	VISHAY CRCW0603681KFEA
35	1	R98	RES, VARIABLE 5k	BOURNS 3386P-1-502-LF
36	1	R99	RES., CHIP, 0.01, 1% 2010	VISHAY, WSL2010R010FEA
37	1	U1	IC, LTC3880EUJ, QFN40P 6mm x 6mm	LTC., LTC3880EUJ
38	1	U2	IC, LTC3870EUF, QFN28P 4mm x 5mm	LTC., LTC3870EUF
39	1	U3	IC, 24LC05-I/ST TSSOP-8_4.4mm	MICROCHIP 24LC025-I/ST
40	1	U4	IC, LT1129CS8-5, SO8NB	LINEAR TECHNOLOGY, LT1129CS8-5
41	1	U5	IC, LTC6992-1 S6-TSOT23	LINEAR TECHNOLOGY, LTC6992IS6-1
42	1	U6	IC, LT1803-5 S5-TSOT23	LINEAR TECHNOLOGY, LT1803IS5
43	0	C17, C37, C52, C69	CAP., OPT 0603	OPT

DC2089A-A Hardware

1	21	E1-E21	TURRET, .062"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	4	JP1, JP3, JP4, JP5	HEADER, 1X3 2mm	SAMTEC TMM-103-02-L-S
3	4	XJP1, XJP3, XJP4, XJP5	SHUNT, 2mm	SAMTEC 2SN-BK-G
4	6	J1-J6	STUD, TESTPIN	PEM KFH-032-10
5	12	J1-J6 (X2)	NUT, BRASS 10-32	ANY #10-32
6	6	J1-J6	RING, LUG #10	KEYSTONE #10
7	6	J1-J6	WASHER, TIN PLATED BRASS	ANY #10
8	1	J7	HEADER, 2X7 2mm, RA (M)	MOLEX, 87760-1416
9	1	J8	HEADER, 2X6 2mm STR DL PCB	FCI 98414-G06-12ULF
10	1	J9	SOCKET, 2X7 2mm RA (F)	SULLINS, NPPN072FJFN-RC
11	3	J10, J11, J12	CONN, BNC, 5PINS	CONNEX, 112404
12	2	SW1, SW2	SWITCH, SUBMINATURE SLIDE	C&K JS202011CQN

DC2089A-B Required Circuit Components

1	2	C1, C2	CAP., OS-CON, 330μF, 16V, 20%, F12	SANYO, 16SVP330M
2	8	C3, C4, C24, C25, C40, C41, C58, C59	CAP., X5R, 10μF, 16V, 10%, 1210	TAIYO YUDEN EMK325BJ106KN
3	6	C5, C18, C26, C42, C53, C57, C70	CAP., X5R, 100nF, 25V, 10%, 0603	AVX 06033C104KAT2A
4	3	C6, C39, C43	CAP., X5R, 4.7μF, 16V, 10%, 0603	TDK C1608X5R1C475K
5	2	C7, C8	CAP., X5R, 1μF, 25V, 10%, 0603	AVX 06033D105KAT2A
6	14	C9, C10, C15, C16, C28, C29, C44, C45, C46, C49, C60, C61, C62, C65	CAP., X5R, 100μF, 6.3V, 10%, 1210	AVX 12106D107AT2A
7	12	C11, C12, C30, C31, C32, C33, C34, C35, C47, C48, C63, C64	CAP, POSCAP 330μF 4V D3L	SANYO, 4TPF330ML
8	2	C22, C23	CAP., X7R, 100pF, 25V, 10%, 0603	AVX 06033C101KAT2A
9	2	C27, C36	CAP., X5R, 10nF, 16V, 10%, 0603	AVX 0603YC103KAT2A
10	2	C54, C56	CAP., NP0, 47pF, 50V, 5% 0603	AVX 06035A470JAT2A
11	4	C19, C38, C55, C68	CAP., X5R 0.22μF 25V 10% 0603	AVX 06033D224KAT2A
12	1	C21	CAP., X5R, 2200pF, 25V, 10% 0603	NIC NMC0603X7R222K50TRPF
13	4	C17, C37, C52, C69	CAP., X5R 1μF 25V 10% 0603	MURATA GRM188R61E105KA12D

DEMO MANUAL

DC2089A-A/DC2089A-B

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
14	4	L1, L2, L3, L4	INDUCTOR, SMT POWER 0.22 μ H	VISHAY, IHLP5050FD-01-022
15	4	D1, D2, D3, D4	DIODE, SCHOTTKY, SOD-323	CENTRAL CMDSH-3TR
16	4	Q1, Q6, Q12, Q15	XSTR, POWER MOSFET LFPK	INFINEON BSC050NE3LS G
17	4	Q3, Q9, Q13, Q18	XSTR, POWER MOSFET LFPK	INFINEON BSC010NE2LSI
18	2	Q7, Q10	TRANS GP SS PNP 40V SOT-23	ON SEMI, MMBT3906LT1G
19	2	R1, R40	RES., CHIP, 2 Ω , 1%, 0603	YAGEO, RC0603FR-072RL
20	8	R2, R3, R4, R5, R20, R27, R31, R122, R123	RES., CHIP, 10k, 1% 0603	NIC NRC06F1002TRF
21	33	R8, R17, R18, R24, R26, R37, R39, R41, R42, R45, R46, R47, R48, R49, R50, R52, R56, R57, R60, R62, R85, R124-R127, R7, R22, R44, R54, R65, R66, R68, R104	RES., CHIP, 0 Ω , 1% 0603	VISHAY, CRCW06030000Z0EA
22	4	R12, R13, R14, R15	RES SENSE., CHIP, 0 Ω , 1W 2512	VISHAY WSL251200000ZEA9
23	1	R25	RES., CHIP, 7.32k, 1% 0603	NIC NRC06F7321TRF
24	1	R28	RES., CHIP, 16.2k, 1% 0603	NIC NRC06F1622TRF
25	1	R29	RES., CHIP, 17.4k, 1% 0603	NIC NRC06F1742TRF
26	2	R33, R35	RES., CHIP, 5.76k, 1%, 0603	NIC NRC06F5761TRF
27	1	R51	RES., CHIP, 90.9k, 1% 0603	NIC NRC06F9092TRF
28	1	R3	RES., CHIP, 4.99k, 1% 0603	VISHAY CRCW06034K99FKEA
29	8	R6, R21, R43, R53, R102, R107, R111, R117	RES., CHIP, 1.4k, 1% 0603	VISHAY CRCW06031K40FKEA
30	1	R16	RES., CHIP, 3.01k, 1% 0603	NIC NRC06F3011TRF
31	4	R75, R106, R110, R116,	RES SENSE., CHIP, 0 Ω , 1W 2512	VISHAY WSL251200000ZEA9
32	1	U1	IC, LTC3880EUJ, QFN40P 6mm x 6mm	LTC., LTC3880EUJ
33	1	U2	IC, LTC3870EUF, QFN28P 4mm x 5mm	LTC., LTC3870EUF

DC2089A-B Additional Circuit Components

1	1	C70	CAP., X5R, 100nF, 25V, 10% 0603	AVX 06033C104KAT2A
2	1	C73	CAP., X5R, 4.7 μ F, 16V, 10% 0603	TDK C1608X5R1C475K
3	0	C13, C14, C50, C51, C66, C67	CAP, POSCAP OPT D3L	
4	0	C20	CAP, OPT 0603	
5	2	C71, C72	CAP., X5R, 10nF, 16V, 10%, 0603	AVX 0603YC103KAT2A
6	3	C74, C78, C79	CAP., X5R, 1 μ F, 16V, 10%, 1206	AVX 1206YD105KAT2A
7	2	C77, C82	CAP., X5R, 2.2 μ F, 50V, 10%, 0805	MURATA GRM21BR61H225KA73L
8	1	C80	CAP., NPO, 150pF, 6.3V 0603	AVX 06036A151JAT2A
9	1	C81	CAP., X7R, 1 μ F, 16V, 10%, 0805	MURATA GRM21BR71C105KA01L
10	1	D5	LED RED S-GW TYPE SMD	ROHM SML-0110VTT86
11	2	D6, D7	LED GREEN S-GW TYPE SMD	ROHM SML-010FTT86L
12	0	D8, D9	LED OPT SOD-323	OPT
13	0	Q2, Q4, Q5, Q8, Q11, Q14, Q16, Q17	XSTR, OPT LFPK	OPT
14	2	Q19, Q20	MOSFET P-CH 20V 0.58A SOT-23	VISHAY TP0101K-T1-E3
15	2	Q21, Q22	MOSFET N-CH 60V 115MA SOT-23	FAIRCHILD 2N7002A
16	1	Q23	MOSFET SPEED SRS 30V 30A LFPK	RENESAS, RJK0305DPB-00#J0
17	1	R88	RES., CHIP, 2 Ω , 1% 0603	YAGEO, RC0603FR-072RL
18	2	R71, R93	RES., CHIP, 10k, 1% 0603	NIC NRC06F1002TRF
19	3	R64, R67, R70	RES., CHIP, 0 Ω , 1% 0603	VISHAY, CRCW06030000Z0EA

dc2089af

DEMO MANUAL

DC2089A-A/DC2089A-B

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
20	0	R9, R11, R19, R30, R36, R38, R55, R58, R59, R61, R63, R69, R80, R81, R100, R101, R113, R114, R119, R120, R121, R74, R105, R109, R115, R103, R108, R112, R118	RES., OPT 0603	OPT
21	1	R72	RES., CHIP, 127, 1% 0603	NIC NRC06F1270TRF
22	1	R73	RES., CHIP, 15.8k, 1% 0603	NIC NRC06F1582TRF
23	3	R76, R77, R96	RES., CHIP, 10, 1% 0603	NIC NRC06F10R0TRF
24	2	R78, R79	RES., CHIP, 200, 1% 0603	NIC NRC06F2000TRF
25	2	R82, R83	RES., CHIP, 4.99k, 1% 0603	VISHAY CRCW06034K99FKEA
26	1	R84	RES., CHIP, 100k, 1% 0603	NIC NRC06F1003TRF
27	1	R86	RES., CHIP, 0.001, 1%, 1W 2010	NIC NCSR150FR001DTR
28	0	R87	RES., CHIP, OPT 2010	OPT
29	2	R89, R95	RES., CHIP, 20k, 1% 0603	NIC NRC06F2002TRF
30	1	R90	RES., CHIP, 154k, 1% 0603	NIC NRC06F1543TRF
31	1	R91	RES., CHIP, 1M, 5% 0603	VISHAY CRCW06031M00JNEA
32	1	R92	RES., CHIP, 3.3, 1% 0603	VISHAY CRCW06033R30FKEA
33	1	R94	RES., CHIP, 82.5, 5% 0603	VISHAY CRCW060382R5FKEA
34	1	R97	RES., CHIP, 681k, 1% 0603	VISHAY CRCW0603681KFEA
35	1	R98	RES, VARIABLE 5k	BOURNS 3386P-1-502-LF
36	1	R99	RES., CHIP, 0.01, 1% 2010	VISHAY, WSL2010R010FEA
37	1	U1	IC, LTC3880EUJ, QFN40P 6mm x 6mm	LTC., LTC3880EUJ
38	1	U2	IC, LTC3870EUF, QFN28P 4mm x 5mm	LTC., LTC3870EUF
39	1	U3	IC, 24LC05-I/ST TSSOP-8_4.4mm	MICROCHIP 24LC025-I/ST
40	1	U4	IC, LT1129CS8-5 SO8NB	LINEAR TECHNOLOGY, LT1129CS8-5
41	1	U5	IC, LTC6992-1 S6-TSOT23	LINEAR TECHNOLOGY, LTC6992IS6-1
42	1	U6	IC, LT1803-5 S5-TSOT23	LINEAR TECHNOLOGY, LT1803IS5

DC2089A-B Hardware

1	21	E1-E21	TURRET, .062"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	4	JP1, JP3, JP4, JP5	HEADER, 1X3 2mm	SAMTEC TMM-103-02-L-S
3	4	XJP1, XJP3, XJP4, XJP5	SHUNT, 2mm	SAMTEC 2SN-BK-G
4	6	J1-J6	STUD, TESTPIN	PEM KFH-032-10
5	12	J1-J6 (X2)	NUT, BRASS 10-32	ANY #10-32
6	6	J1-J6	RING, LUG #10	KEYSTONE #10
7	6	J1-J6	WASHER, TIN PLATED BRASS	ANY #10
8	1	J7	HEADER 2X7 2mm, RA (M)	MOLEX, 87760-1416
9	1	J8	HEADER, 2X6 2mm STR DL PCB	FCI 98414-G06-12ULF
10	1	J9	SOCKET 2X7 2mm RA (F)	SULLINS, NPPN072FJFN-RC
11	3	J10, J11, J12	CONN, BNC, 5PINS	CONNEX, 112404
12	2	SW1, SW2	SWITCH, SUBMINATURE SLIDE	C&K JS202011CQN

DEMO MANUAL DC2089A-A/DC2089A-B

SCHEMATIC DIAGRAM

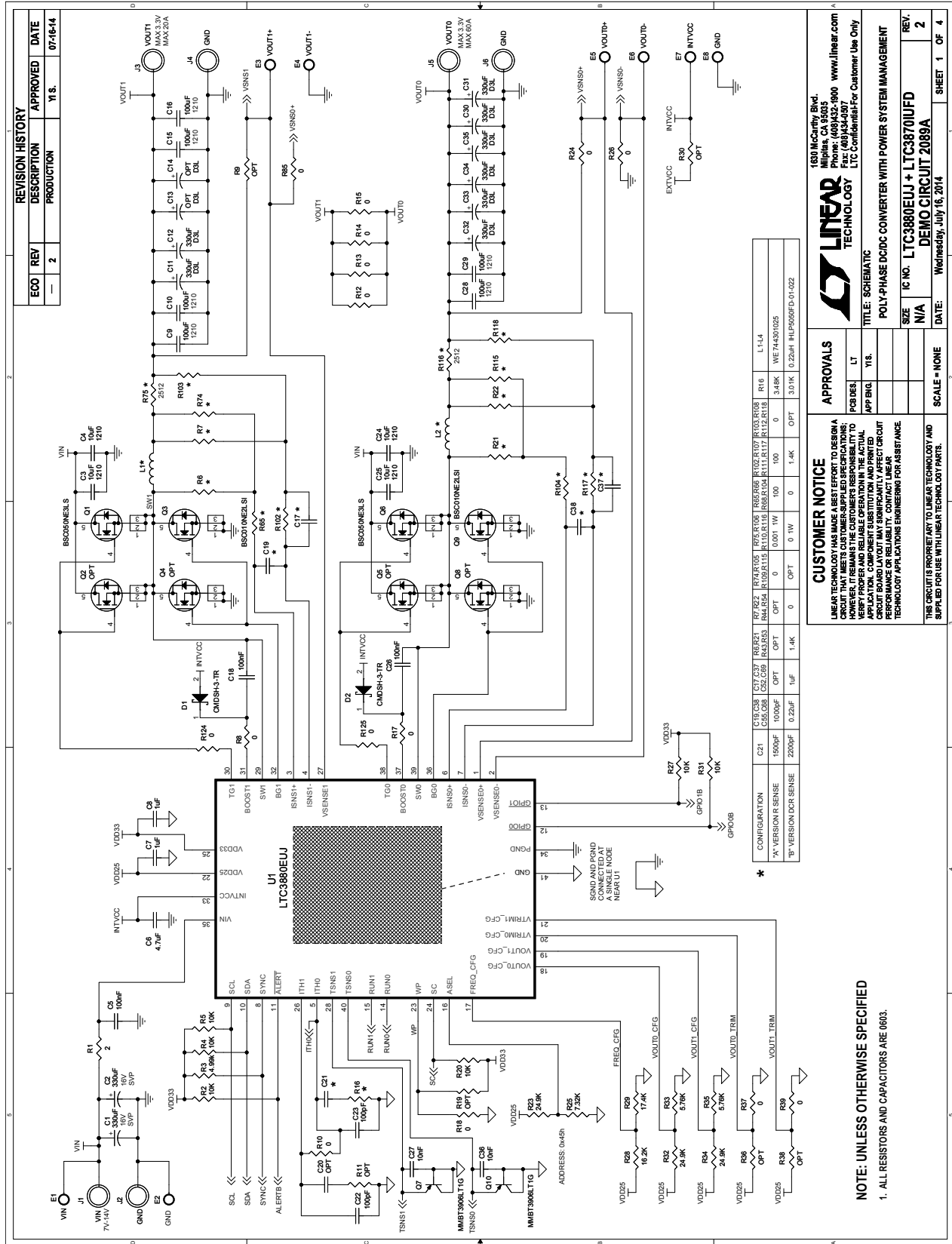
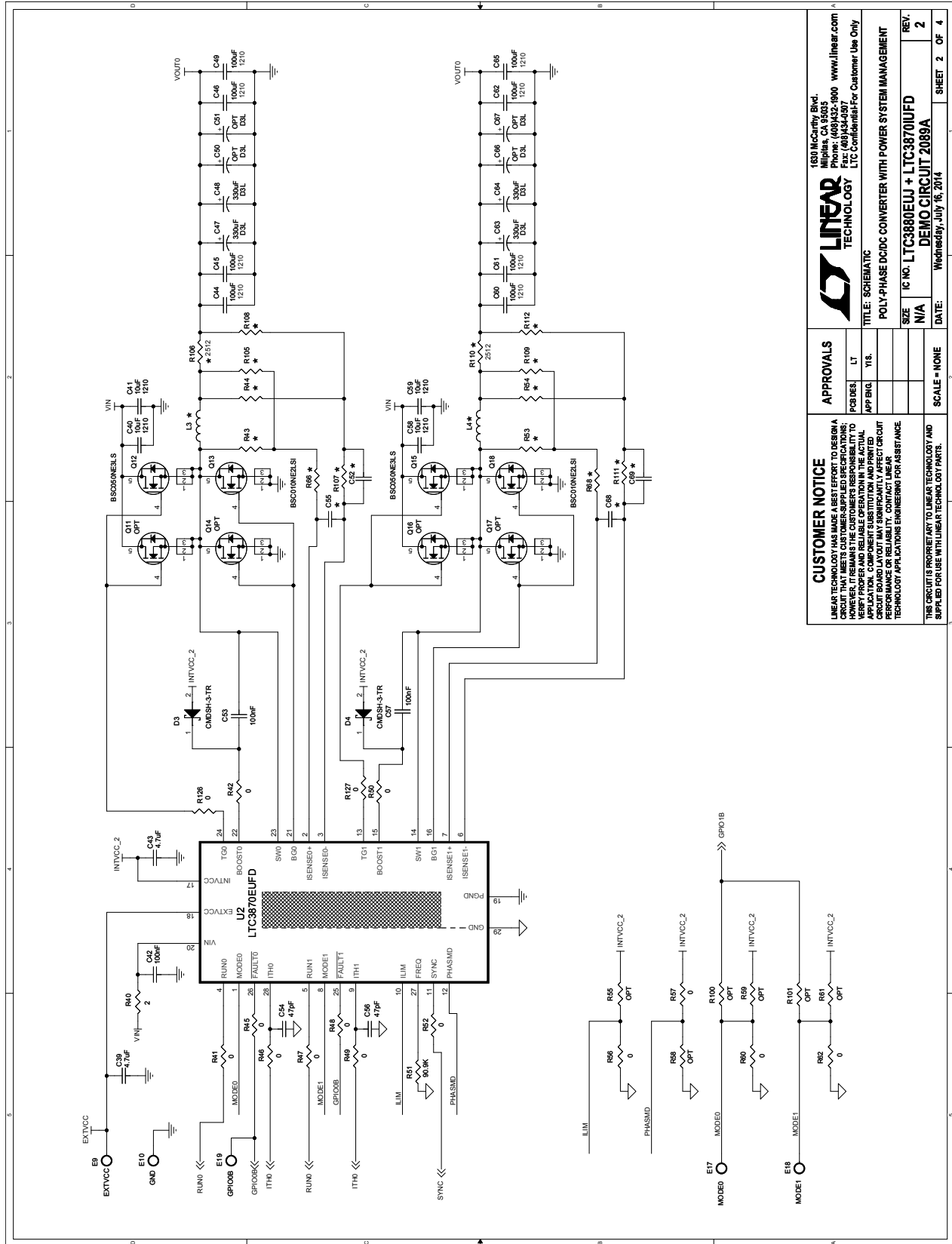


Figure 7. DC2089A Demo Circuit Schematic, Sheet 1 of 4

SCHEMATIC DIAGRAM



CUSTOMER NOTICE		APPROVALS	
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A SCHEMATIC FOR THE CUSTOMER'S USE. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD MANUFACTURING VARIATIONS MAY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.		DESIGNER	LT
THIS SCHEMATIC IS SUBJECT TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.		APP'NG	YLS
		SCALE	NONE
		DATE	Wednesday, July 16, 2014
		SIZE	N/A
		IC NO.	LTC3880EUJ + LTC3870UFD
		DEMO CIRCUIT	2089A
		REV.	2
		SHEET	2 OF 4

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LTC3880EUJ + LTC3870UFD
LTC Confidential For Customer Use Only

Figure 8. DC2089A Demo Circuit Schematic, Sheet 2 of 4

DEMO MANUAL DC2089A-A/DC2089A-B

SCHEMATIC DIAGRAM

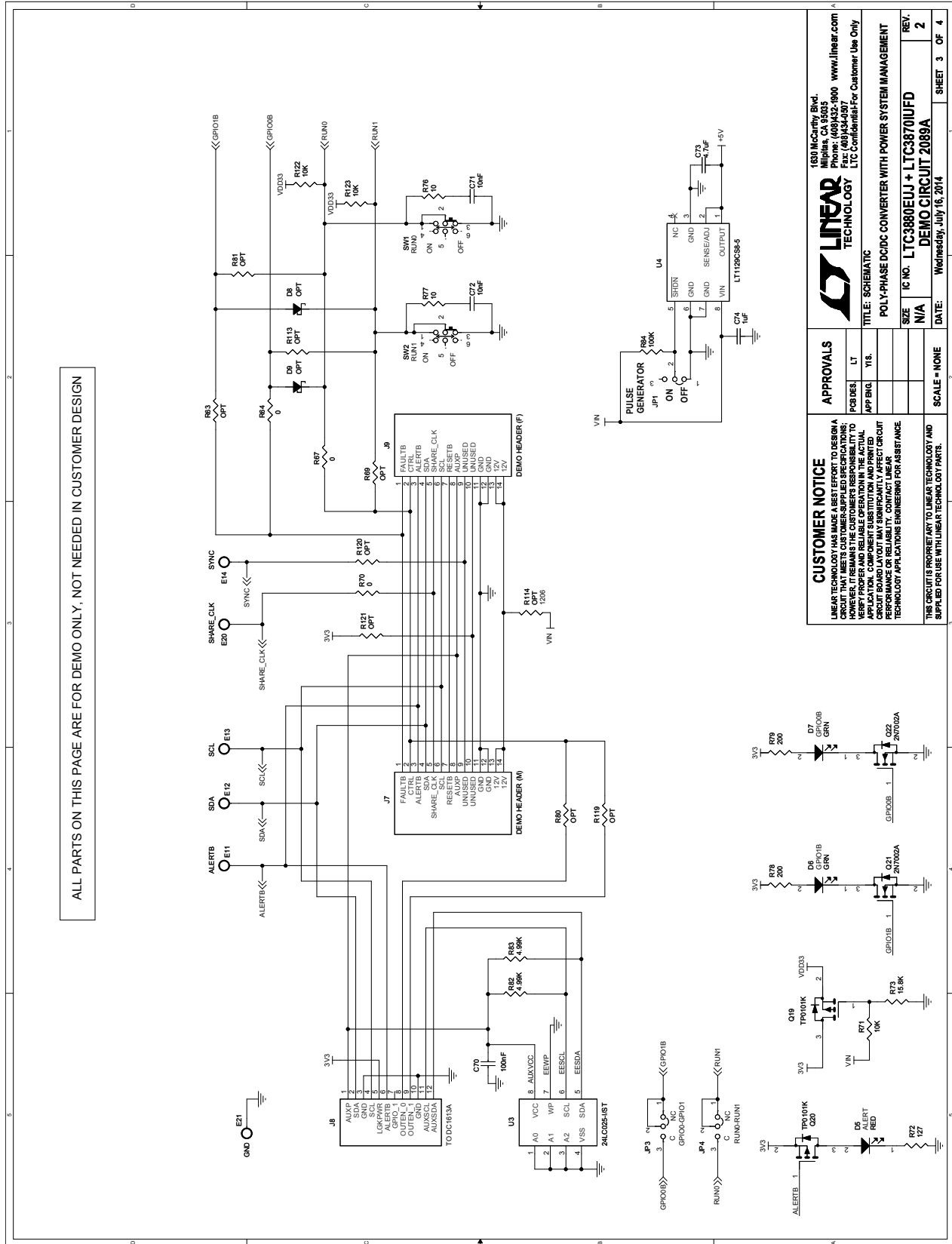


Figure 9. DC2089A Demo Circuit Schematic, Sheet 3 of 4

SCHEMATIC DIAGRAM

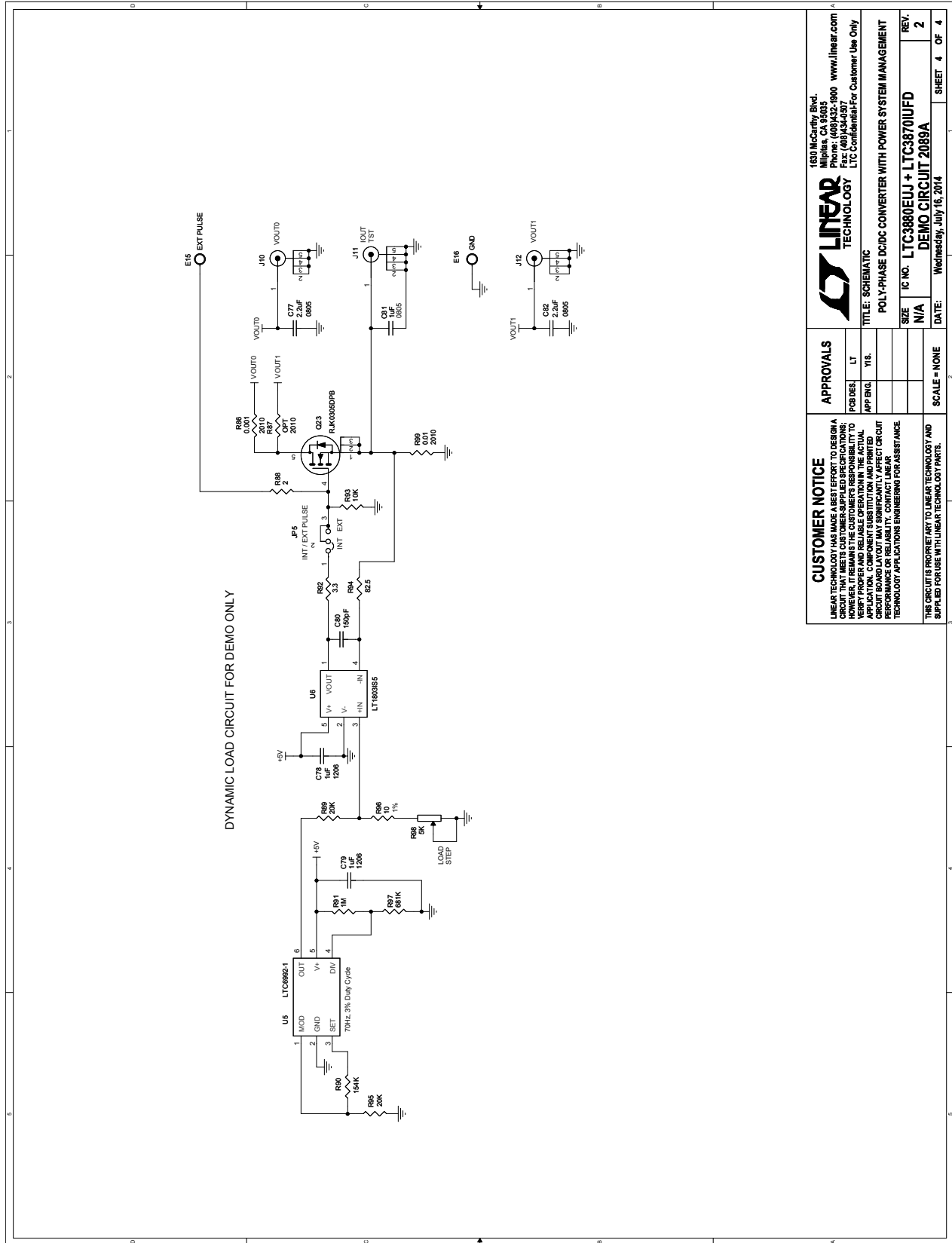


Figure 10. DC2089A Demo Circuit Schematic, Sheet 4 of 4

DEMO MANUAL

DC2089A-A/DC2089A-B

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