

# LTC3882EUJ High Efficiency Step-Down DC/DC Converter with Digital Power System Management

## DESCRIPTION

Demonstration circuit 2291A is a high current, high efficiency, PolyPhase<sup>®</sup> synchronous buck converter featuring the LTC<sup>®</sup>3882EUJ, a dual output voltage mode controller. This demo board incorporates two LTC3882 controllers which provide four phases to deliver up to 140A. The default output voltage is 1V and can be adjusted from 0.5V to 2V. The LTC3882 has the PMBus interface and digital power system management functions.

The DC2291A powers up to default settings and produces power based on configuration resistors or with its nonvolatile memory 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 parts, download

the GUI software LTpowerPlay<sup>™</sup> onto your PC and use LTC's I<sup>2</sup>C/SMBus/PMBus Dongle DC1613A to connect to the board. LTpowerPlay allows the user to reconfigure the part on-the-fly and store the configuration settings within its onboard EEPROM, along with viewing telemetry parameters that include voltage, current, temperature and fault status.

## GUI DOWNLOAD

The software can be downloaded from:

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

**Design files for this circuit board are available at <http://www.linear.com/demo/DC2291A>**

LT, LT, LTC, LTM, Linear Technology, the Linear logo, PolyPhase and LTpowerPlay are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

## PERFORMANCE SUMMARY Specifications are at T<sub>A</sub> = 25°C

| SYMBOL            | PARAMETER                 | CONDITIONS  | MIN | TYP  | MAX   | UNITS |
|-------------------|---------------------------|---|-----|------|-------|-------|
| V <sub>IN</sub>   | Input Supply Range        |   | 7   | 12   | 14    | V     |
| V <sub>OUT0</sub> | Output Voltage Range      | I <sub>OUT0</sub> = 0A to 140A, V <sub>IN</sub> = 7V to 14V       | 0.5 | 1.0  | 2.0*  | V     |
| I <sub>OUT0</sub> | Output Current Range      |   | 0   |      | 140** | A     |
| F <sub>SW</sub>   | Factory Default Switching |   |     | 450  |       | kHz   |
| EFFICIENCY        | Full Load Efficiency      | V <sub>OUT0</sub> = 1.0V, I <sub>OUT0</sub> = 140A, See Figure 4. |     | 88.6 |       | %     |

\*Note: The DC2291A uses 2.5V-rated low ESR PosCAP (Part No. 2R5TPE470M7) as output capacitors for optimized load transient performance. If >2.0V V<sub>OUT</sub> is needed, 4V or 6.3V-rated output capacitors should be used.

\*\*Note: When continuously running at full load, forced air flow is needed.

## QUICK START PROCEDURE

Demonstration circuit 2291A makes it easy to set up to evaluate the performances of the LTC3882. 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 C50. See Figure 3 for proper scope probe technique.

1. Make sure jumpers are in the following positions:

| JUMPER | POSITION | FUNCTION                                |
|--------|----------|---|
| JP5    | ON       | External 5V VDR for DrMOS               |
| JP7    | ON       | External 5V V <sub>CC</sub> for LTC3882 |

2. With power off, connect the input power supply to V<sub>IN</sub> and GND. Connect active load to the output (through J3 and J18 for V<sub>OUT</sub> and J4 and J19 for GND).

3. Make sure RUN switch (SW4) is OFF.

4. Turn on the power at the input.

**Note.** Make sure that the input voltage does not exceed 15V.

5. Turn on RUN switch (SW4) as desired.

6. Check for the correct output voltage from V<sub>OUT0</sub><sup>+</sup> to V<sub>OUT0</sub><sup>-</sup>.

**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 voltages from the GUI. See “LTpowerPlay QUICK START” session for details.

## CONNECTING A PC TO DC2291A

You can use a PC to reconfigure the power management features of the LTC3882 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.

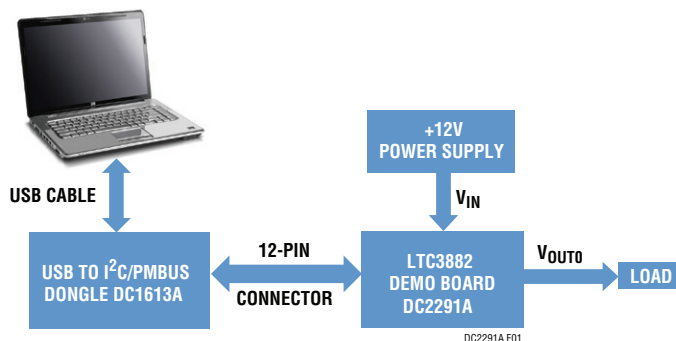


Figure 1. Demo Setup with PC

## QUICK START PROCEDURE

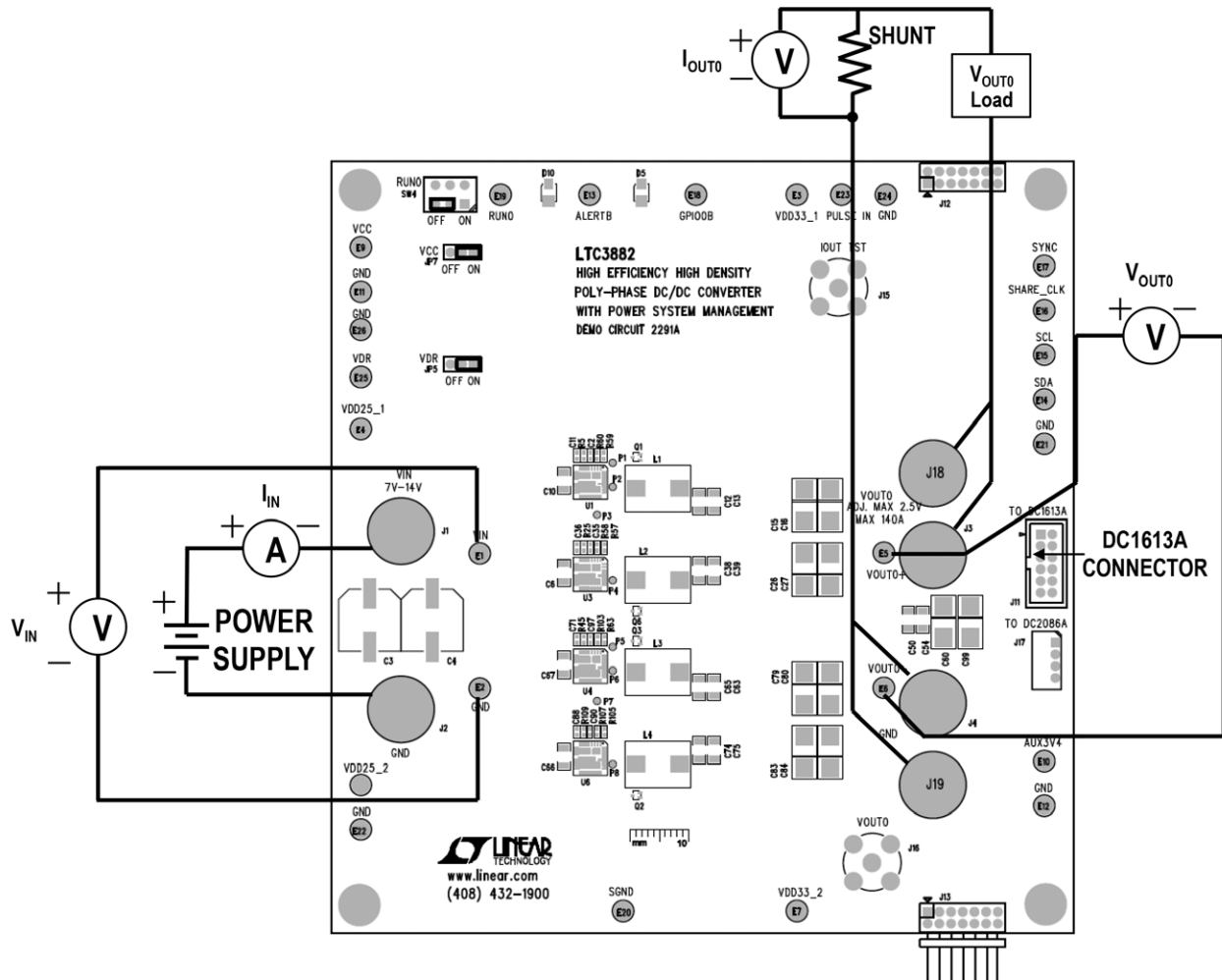


Figure 2. Power Test Setup

## QUICK START PROCEDURE

### COMBINING DC2291A WITH OTHER DIGITAL POWER DEMO BOARDS

The DC2291A may be plugged together in a multi-board array with other LTC power system management boards using J12 and J13.

- Measure  $V_{IN}$  across the input ceramic capacitor (C6). Measure  $V_{OUT}$  across the output ceramic capacitor (C38);
- Add the loss from external 5V supply into the efficiency calculation.

### MEASURING EFFICIENCY (SEE FIGURE 4)

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

- Set JP5 and JP7 on the “OFF” position;
- Connect external 5V supply to VDR and  $V_{CC}$  turrets and measure its input current;

### MEASURING OUTPUT RIPPLE VOLTAGE

An accurate ripple measurement may be performed by using the configuration across C50 as shown in Figure 3.

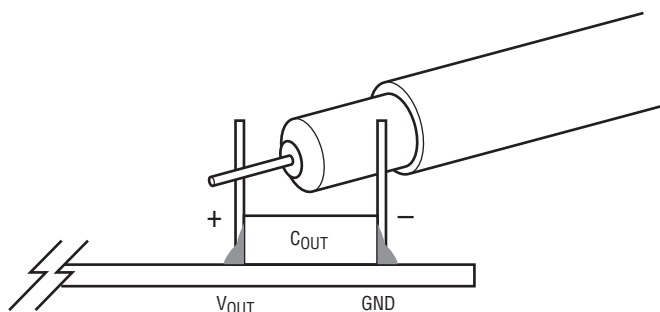


Figure 3. Measuring Output Voltage Ripple

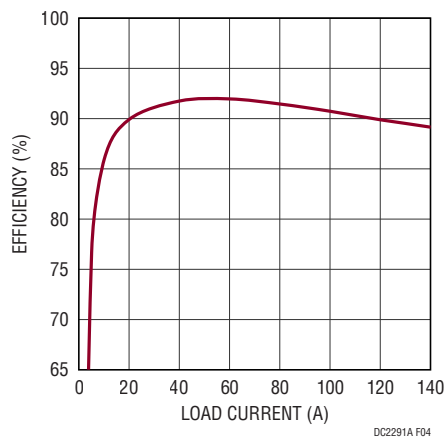


Figure 4. Typical Efficiency Curves of DC2291A,  $V_{IN} = 12V$ ,  $V_0 = 1.0V$ ,  $F_{SW} = 450kHz$ , CCM

## QUICK START PROCEDURE



Figure 5. Load Transient Waveform of DC2291A,  $V_{IN} = 12V$ ,  $V_0 = 1.0V$ ,  $F_{SW} = 450kHz$ , 0% to 25% (0A to 35A) Load Step

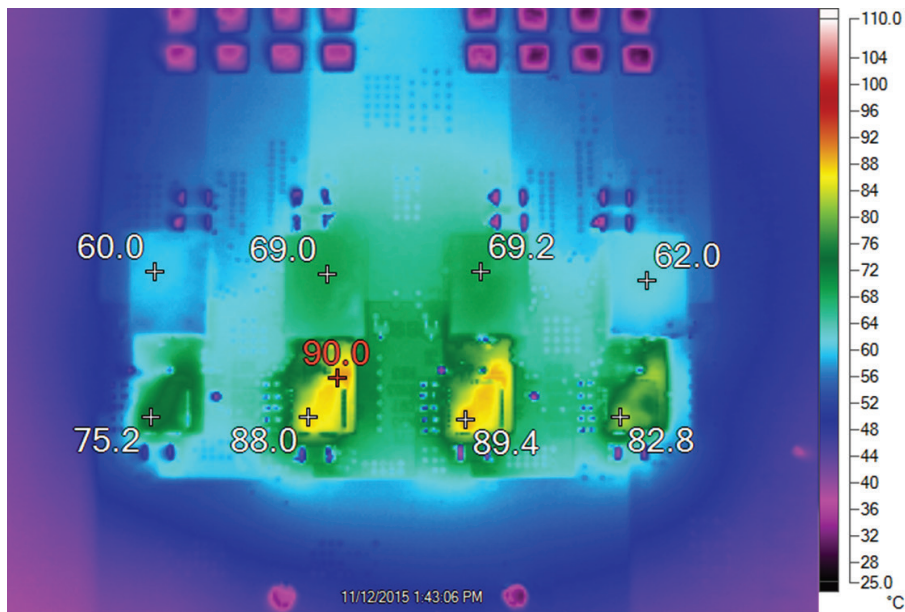


Figure 6. Thermal Picture of DC2291A,  $V_{IN} = 12V$ ,  $V_0 = 1.0V$ ,  $I_0 = 140A$ ,  $F_{SW} = 450kHz$ , 400LFM Airflow,  $T_A = 25^\circ C$

## LTpowerPlay SOFTWARE GUI

LTpowerPlay is a powerful Windows-based development environment that supports Linear Technology's power system management ICs, including the LTC3880, LTC3882, LTC3883, LTM<sup>®</sup>4676, LTC2974, LTC2978 etc. 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 LTC3882's DC2291A 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.

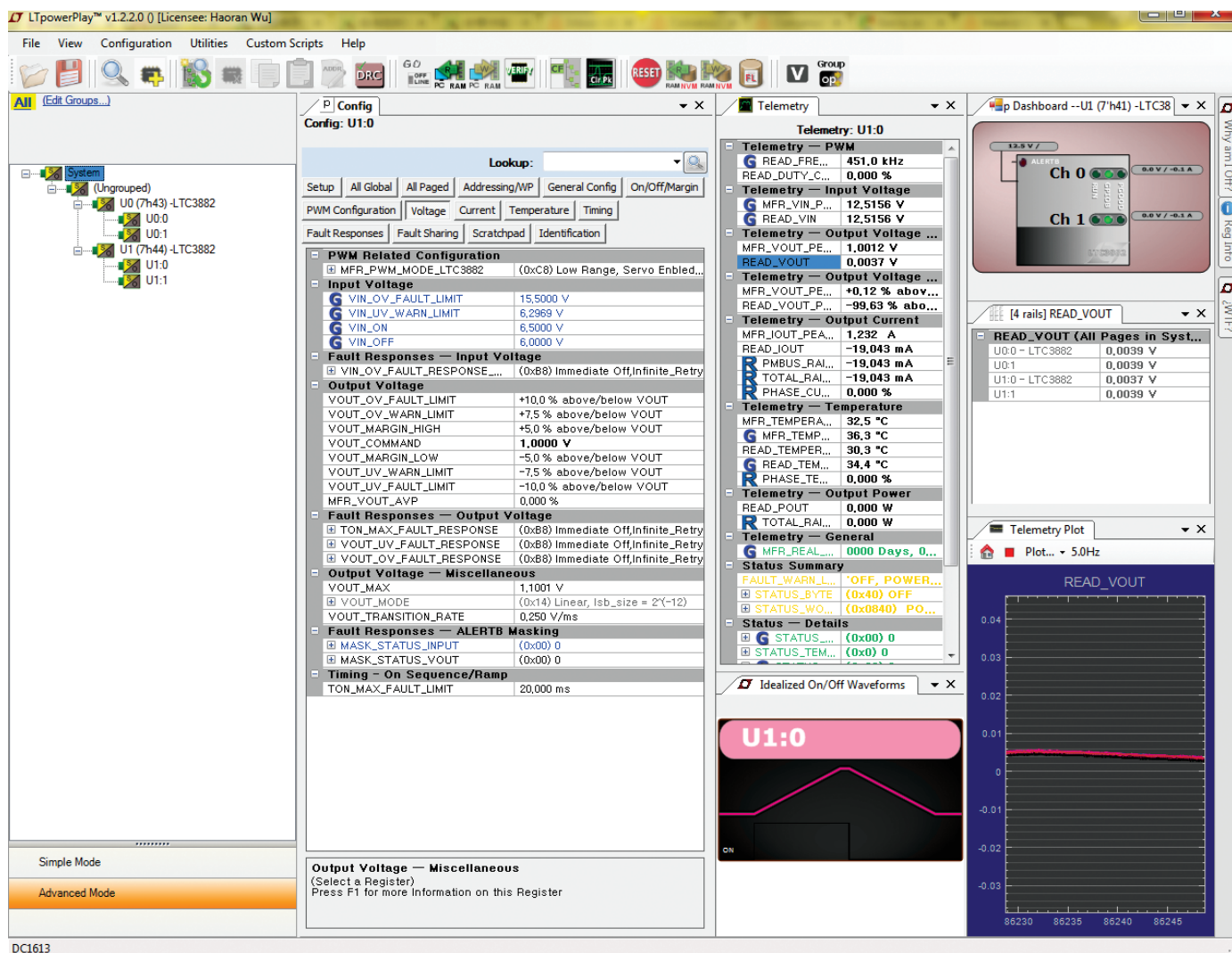


Figure 7. LTpowerPlay Main Interface



## LTpowerPlay QUICK START PROCEDURE

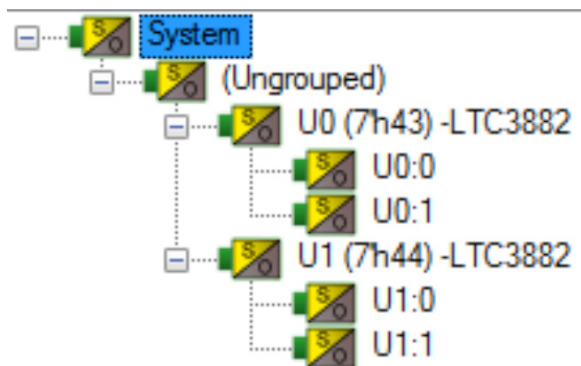
The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTC3882.

1. Download and install the LTpowerPlay GUI:

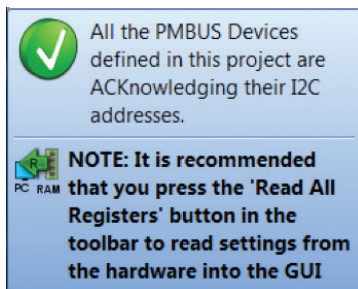
<http://www.linear.com/LTpowerPlay>

2. Launch the LTpowerPlay GUI.

- a. The GUI should automatically identify the DC2291A. The system tree on the left hand side should look like this:



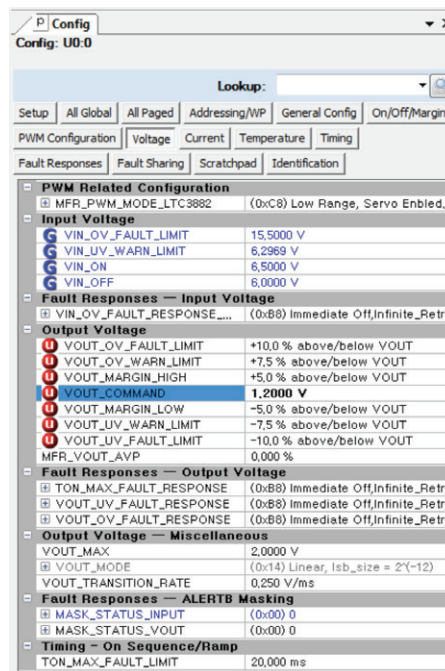
- b. A green message box shows for a few seconds in the lower left hand corner, confirming that the LTC3882 is communicating:



- c. In the Toolbar, click the “R” (RAM to PC) icon to read the RAM from the LTC3882. This reads the configuration from the RAM of LTC3882 and loads it into the GUI.



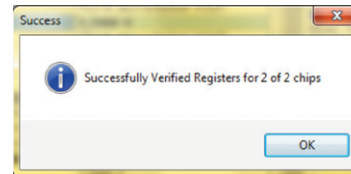
- d. If you want to change the output voltage to a different value, like 1.2V. In the Config tab, type in 1.2 in the VOUT\_COMMAND box, like this:



Then, click the “W” (PC to RAM) icon to write these register values to the LTC3882. After finishing this step, you will see the output voltage will change to 1.2V.



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



- e. You can save the changes into the NVM. In the toolbar, click “RAM to NVM” button:



- 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              |
|------------------------------------|-----|--|--|---------------------------------------|
| <b>Required Circuit Components</b> |     |  |  |                                       |
| 1                                  | 2   | CFFW1, CFFW2   | CAP, 22pF, COG, 50V, 10%, 0402                           | KEMET, C0402C220K5GACTU               |
| 2                                  | 1   | CIN1   | CAP, TANT., 22µF, X5R, 35V, 20%, 7343                    | AVX, TPSY226M035R0200                 |
| 3                                  | 8   | C6, C10, C33, C34, C66, C67, C86, C87  | CAP, 22µF, X5R, 25V, 10%, 1206                           | MURATA, GRM31CR61E226KE15L            |
| 4                                  | 1   | CIN5   | CAP, 10µF, X5R, 35V, 20%, 1206                           | TAIYO YUDEN, GMK316BJ106ML-T          |
| 5                                  | 2   | COUT9, COUT7   | CAP, 47µF, X5R, 16V, 20%, 1206                           | TDK, C3216X5R1C476M160AB              |
| 6                                  | 4   | C3, C4, C24, C46   | CAP, OSCON, 330µF, 16V, 20%, F12                         | PANASONIC, 16SVP330M                  |
| 7                                  | 2   | C9, C25  | CAP, 4.7µF, X5R, 6.3V, 20%, 0402                         | SAMSUNG, CL05A475MQ5NRNC              |
| 8                                  | 16  | C12, C13, C14, C29, C38, C39, C40, C41, C50, C54, C63, C64, C65, C74, C75, C91 | CAP, 100µF, X5R, 6.3V, 20%, 1206                         | MURATA, GRM31CR60J107ME39L            |
| 9                                  | 12  | C17, C18, C19, C28, C55, C60, C69, C76, C81, C82, C99, C100                    | CAP, POSCAP, 470µF, 2.5V, 0.007Ω, 4400mA, D2E CASE       | PANASONIC, 2R5TPE470M7                |
| 10                                 | 4   | C20, C42, C58, C85   | CAP, 0.22µF, X5R, 16V, 10%, 0402                         | TDK, C1005X5R1C224K050BB              |
| 11                                 | 1   | C21  | CAP, 2200pF, X7R, 50V, 10%, 0402                         | MURATA, GRM155R71H222KA01D            |
| 12                                 | 1   | C22  | CAP, 220pF, X7R, 50V, 10%, 0402                          | MURATA, GRM155R71H221KA01D            |
| 13                                 | 1   | C30  | CAP, 47pF, NP0, 25V, 10%, 0402                           | MURATA, GRM1555C1E470KA01D            |
| 14                                 | 4   | L1, L2, L3, L4   | IND., PWR., 0.17µH, 10%, 61A                             | COOPER BUSSMANN, FP1007R3-R17-R       |
| 15                                 | 4   | R2, R3, R15, R110  | RES., 24.9k, 1/16W, 1%, 0402                             | VISHAY, CRCW040224K9FKED              |
| 16                                 | 5   | R29, R31, R37, R42, R64  | RES., 24.9k, 1/10W, 1%, 0603                             | VISHAY, CRCW060324K9FKEA              |
| 17                                 | 9   | R5, R25, R41, R45, R109, R114, R115, R116, R117                                | RES., 0Ω, 1/16W, 0402                                    | VISHAY, CRCW04020000Z0ED              |
| 18                                 | 5   | R24, R51, R71, R73, R83,   | RES., 0Ω, 1/10W, 0603                                    | VISHAY, CRCW06030000Z0EA              |
| 19                                 | 4   | R7, R27, R93, R111   | RES., 2.67k, 1/16W, 1%, 0402                             | VISHAY, CRCW04022K67FKED              |
| 20                                 | 1   | R9   | RES., 180Ω, 1/16W, 1%, 0402                              | VISHAY, CRCW0402180RFKED              |
| 21                                 | 7   | R10, R11, R13, R19, R20, R43, R86  | RES., 10k, 1/10W, 1%, 0603                               | VISHAY, CRCW060310K0FKEA              |
| 22                                 | 1   | R12  | RES., 7.32k, 1/16W, 1%, 0402                             | VISHAY, CRCW04027K32FKED              |
| 23                                 | 2   | R14, R17   | RES., 2k, 1/10W, 1%, 0603                                | VISHAY, CRCW06032K00FKEA              |
| 24                                 | 9   | R26, R57, R58, R59, R60, R63, R103, R105, R107                                 | RES., 1k, 1/16W, 1%, 0402                                | VISHAY, CRCW04021K00FKED              |
| 25                                 | 1   | R30  | RES., 4.32k, 1/10W, 1%, 0603                             | VISHAY, CRCW06034K32FKEA              |
| 26                                 | 3   | R32, R44, R65  | RES., 5.76k, 1/10W, 1%, 0603                             | VISHAY, CRCW06035K76FKEA              |
| 27                                 | 1   | R38  | RES., 9.09k, 1/10W, 1%, 0603                             | VISHAY, CRCW06039K09FKEA              |
| 28                                 | 4   | U1, U3, U4, U6   | I.C., MODULE, 60A, 31-LEAD, CLIP BOND PQFN, SPS, 5 × 5mm | FAIRCHILD SEMI., FDMF5820DC           |
| 29                                 | 1   | U2   | I.C., LTC3882EUJ#PBF, QFN, 6 × 6mm                       | LINEAR TECH., LTC3882EUJ#10EG-1PBF-ES |
| 30                                 | 1   | U8   | I.C., LTC3882EUJ#PBF, QFN, 6 × 6mm                       | LINEAR TECH., LTC3882EUJ#10EH-1PBF-ES |

# DEMO MANUAL DC2291A

## PARTS LIST

| ITEM  | QTY | REFERENCE   | PART DESCRIPTION  | MANUFACTURER/PART NUMBER              |
|---|-----|---|---|---------------------------------------|
| <b>Additional Demo Board Circuit Components</b> |     |   |   |                                       |
| 1   | 10  | C5, C52, C53, C56, C68, C51, C11, C36, C71, C88             | CAP., 0.1 $\mu$ F, X7R, 16V, 10%, 0402                  | AVX, 0402YC104KAT2A                   |
| 2   | 3   | COU8, COU10, C45  | CAP., 0.1 $\mu$ F, X7R, 16V, 10%, 0603                  | AVX, 0603YC104KAT2A                   |
| 3   | 1   | C59   | CAP., 0.1 $\mu$ F, X5R, 16V, 10%, 0805                  | AVX,0805YD104KAT2A                    |
| 4   | 13  | C1, C2, C7, C8, C31, C35, C47, C57, C61, C77, C89, C90, C97 | CAP., 1 $\mu$ F, X5R, 10V, 20%, 0402                    | MURATA, GRM155R61A105ME15D            |
| 5   | 1   | C49   | CAP., 1 $\mu$ F, X5R, 16V, 10%, 0805                    | AVX, 0805YD105KAT2A                   |
| 6   | 10  | C5, C52, C53, C56, C68, C51, C11, C36, C71, C88             | CAP., 0.1 $\mu$ F, X7R, 16V, 10%, 0402                  | AVX, 0402YC104KAT2A                   |
| 7   | 3   | COU8, COU10, C45  | CAP., 0.1 $\mu$ F, X7R, 16V, 10%, 0603                  | AVX, 0603YC104KAT2A                   |
| 8   | 1   | C59   | CAP., 0.1 $\mu$ F, X5R, 16V, 10%, 0805                  | AVX,0805YD104KAT2A                    |
| 9   | 13  | C1, C2, C7, C8, C31, C35, C47, C57, C61, C77, C89, C90, C97 | CAP., 1 $\mu$ F, X5R, 10V, 20%, 0402                    | MURATA, GRM155R61A105ME15D            |
| 10  | 1   | C49   | CAP., 1 $\mu$ F, X5R, 16V, 10%, 0805                    | AVX, 0805YD105KAT2A                   |
| 11  | 4   | C32, C48, C73, C98  | CAP., 0.01 $\mu$ F, X7R, 16V, 10%, 0402                 | AVX, 0402YC103KAT2A                   |
| 12  | 1   | C44   | CAP., 0.01 $\mu$ F, X7R, 50V, 10%, 0603                 | AVX, 06035C103KAT2A                   |
| 13  | 2   | C37, C70  | CAP., 56pF, NPO, 25V, 10%, 0402                         | KEMET, C0402C560K3GACTU               |
| 14  | 1   | D5  | LED, YELLOW GREEN, WATER CLEAR, 571nm, 0603             | LITE-ON, LTST-C193KGBT-5A             |
| 15  | 3   | D8, D9, D12   | DIODE, ULTRA LOW SCHOTTKY RECTIFIER, 20V, 0.5A, SOD-882 | IXYS SEMI., PMEG2005AEL,315           |
| 16  | 1   | D10   | LED, RED, WATER CLEAR, 631nm, 0603                      | LITE-ON, LTST-C193KRKT-5A             |
| 17  | 2   | L5, L6  | IND., PWR., SHIELDED, 4.7 $\mu$ H, 20%                  | COILCRAFT, XFL4020-472MEC             |
| 18  | 4   | Q1, Q2, Q3, Q6  | XSTR., GP, PNP, 40V, 0.2A, SC75-3, SOT-416              | ON SEMI, MMBT3906TT1G                 |
| 19  | 1   | Q4  | XSTR., MOSFET, SWITCHING, PWR, N-CH, 30V, 30A, LPAK     | RENESAS ELECTRONICS, RJK0305DPB-00-J0 |
| 20  | 3   | Q19, Q20, Q22   | XSTR., MOSFET, P-CH, 20V, 5.9A, SOT-23, TO-236          | VISHAY, SI2365EDS-T1-GE3              |
| 21  | 1   | Q21   | XSTR., MOSFET, N-CH, 60V, 115mA, SOT-23                 | DIODES INC., 2N7002-7-F               |
| 22  | 1   | RPG1  | RES., 100k, 1/16W, 1%, 0402                             | VISHAY, CRCW0402100KFKED              |
| 23  | 2   | R1, R4  | RES., 1 $\Omega$ , 1/16W, 1%, 0402                      | VISHAY, CRCW04021R00FKED              |
| 24  | 2   | R46, R49  | RES., SENSE, 0.01 $\Omega$ , 1W, 1%, 2512               | PANASONIC, ERJM1WSF10MU               |
| 25  | 2   | R66, R67  | RES., 619k, 1/16W, 1%, 0402                             | VISHAY, CRCW0402619KFKED              |
| 26  | 2   | R68, R69  | RES., 84.5k, 1/16W, 1%, 0402                            | VISHAY, CRCW040284K5FKED              |
| 27  | 2   | R70, R16  | RES., 10 $\Omega$ , 1/10W, 1%, 0603                     | VISHAY, CRCW060310R0FKEA              |

## PARTS LIST

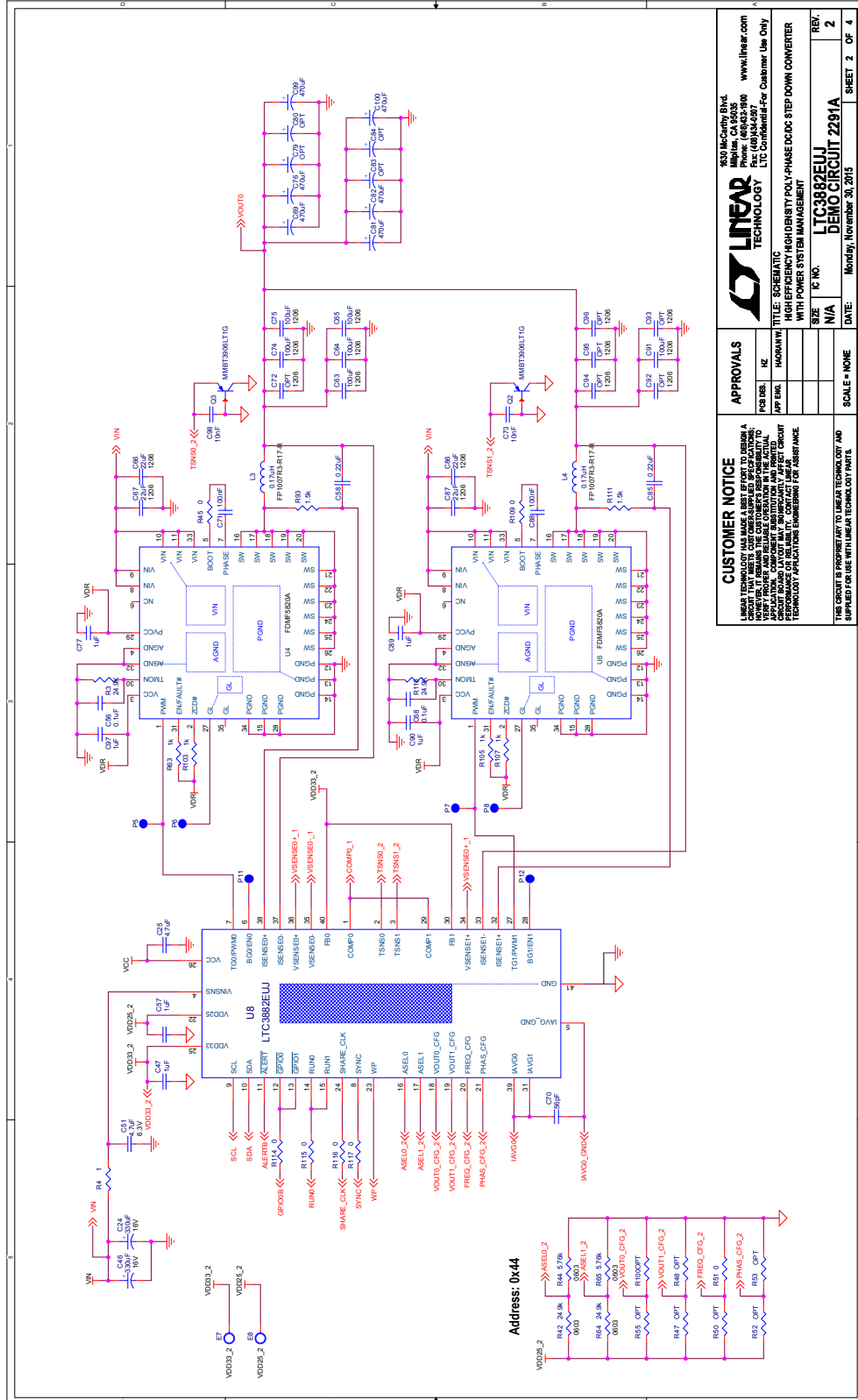
| ITEM | QTY | REFERENCE  | PART DESCRIPTION  | MANUFACTURER/PART NUMBER     |
|------|-----|--|---|------------------------------|
| 28   | 2   | R76, R77   | RES., 4.99k, 1/10W, 1%, 0603  | VISHAY, CRCW06034K99FKEA     |
| 29   | 1   | R81  | RES., 200Ω, 1/10W, 1%, 0603   | VISHAY, CRCW0603200RFKEA     |
| 30   | 1   | R84  | RES., 127Ω, 1/10W, 1%, 0603   | VISHAY, CRCW0603127RFKEA     |
| 31   | 1   | R87  | RES., 15.8k, 1/10W, 1%, 0603  | VISHAY, CRCW060315K8FKEA     |
| 32   | 0   | R23, R33, R34, R35, R36, R39, R40, R47, R48, R50, R52, R53, R55, R74, R75, R78, R82, R92, R100 (OPT) | RES., OPTION, 0603  |                              |
| 33   | 0   | D7 (OPT)   | DIODE, OPTION, SOD-323  |                              |
| 34   | 1   | SW4  | SWITCH, SUB-MINIATURE SLIDE, DPDT, 6VDC, 0.3A, THRU-HOLE  | C&K COMPONENTS, JS202011CQN  |
| 35   | 1   | U5   | I.C., EEPROM SERIAL-I <sup>2</sup> C, 2K-BIT, TSSOP-8   | MICROCHIP, 24LC025-I/ST      |
| 36   | 1   | U7   | I.C., DUAL 1A, 17V, 5μA 1MHz SYNCH BUCK CONVERTER FOR THE 3622 AND DUAL 1A, 17V, 5μA 2.25MHz SYNCH BUCK CONVERTER | LINEAR TECH., LTC3622EDE#PBF |
| 37   | 0   | C23, C43, C72, C92, C93, C94, C95, C96   | CAP., OPTIONAL 1206   |                              |
| 38   | 0   | C15, C16, C26, C27, C79, C80, C83, C84   | CAP., OPTIONAL D2E CASE   |                              |

### Hardware for Demo Board Only

|    |    |                               |   |   |
|----|----|-------------------------------|---|---|
| 1  | 26 | E1-E26                        | TEST POINT, TURRET, .094" MTG. HOLE               | MILL-MAX, 2501-2-00-80-00-00-07-0           |
| 2  | 2  | JP5, JP7                      | CONN., HEADER, 1 × 3, 2mm                         | WURTH ELEKTRONIK 62000311121                |
| 3  | 2  | JP5, JP7                      | SHUNT, 2mm  | SAMTEC, 2SN-BK-G                            |
| 4  | 6  | J1, J2, J3, J4, J18, J19      | STUD, FASTENER, #10-32                            | PENN ENGINEERING, KFH-032-10                |
| 5  | 12 | J1, J2, J3, J4, J18, J19 (×2) | NUT, BRASS 10-32                                  | ANY #10-32M/S BR PL                         |
| 6  | 6  | J1, J2, J3, J4, J18, J19      | RING, LUG, CRIMP, #10                             | KEYSTONE, 8205                              |
| 7  | 6  | J1, J2, J3, J4, J18, J19      | WASHER, TIN PLATED BRASS                          | ANY #10 EXT BZ TN                           |
| 8  | 1  | J11                           | CONN., HEADER, 2 × 6, 2mm, STR DL, THRU-HOLE      | FCI, 98414-G06-12ULF                        |
| 9  | 1  | J12                           | CONN., HEADER, 2 × 7, 2mm, R/A (F)                | SULLINS CONNECTOR SOLUTIONS, NPPN072FJFN-RC |
| 10 | 1  | J13                           | CONN., HEADER, 2 × 7, 2mm, R/A (M)                | MOLEX, 87760-1416                           |
| 11 | 2  | J15, J16                      | CONN., BNC PC MOUNT RECEPT. JACK, 50Ω, TF-4 POST  | CONNEX, 112404                              |
| 12 | 1  | J17                           | CONN., HEADER, SHROUDED, 4POS, 2mm, R/A THRU-HOLE | HIROSE, DF3A-4P-2DSA                        |
| 13 | 4  | MT1, MT2, MT3, MT4            | STANDOFF, NYLON, SNAP-ON, 0.500"                  | KEYSTONE, 8833                              |



# DEMO MANUAL DC2291A



| APPROVALS |              |
|-----------|--------------|
| DESIGNER  | IC           |
| APP BKL   | IC           |
| DATE      | SCALE = NONE |
| REV.      | 2            |
| REV.      | 2            |

| CUSTOMER NOTICE  |  |
|--|--|
| LTC3882EUJ is a proprietary technology of Linear Technology Corporation. This circuit is not intended for use in safety-critical applications. The user must ensure that the circuit is used in a manner consistent with the specifications and limitations of the device. The user must also ensure that the circuit is used in a manner consistent with the safety requirements of the applicable regulatory agencies. The user must also ensure that the circuit is used in a manner consistent with the safety requirements of the applicable regulatory agencies. |  |

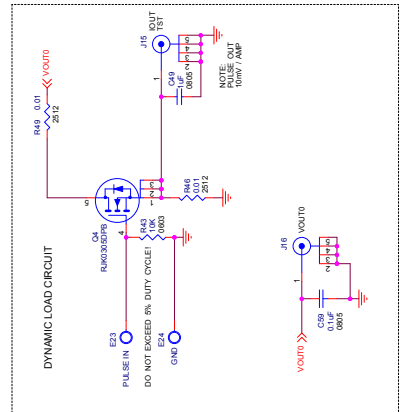
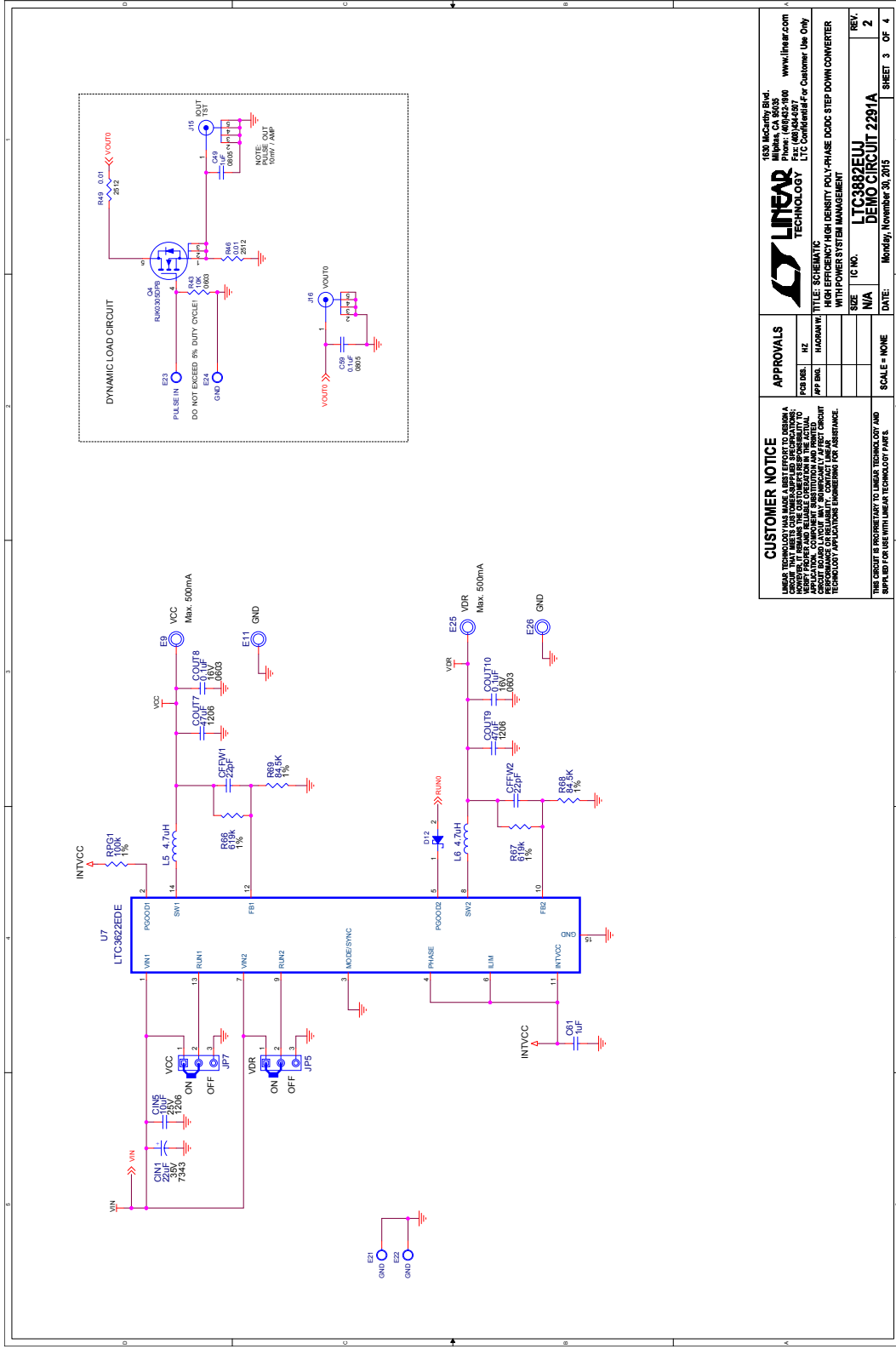
  

| APPROVALS |              |
|-----------|--------------|
| DESIGNER  | IC           |
| APP BKL   | IC           |
| DATE      | SCALE = NONE |
| REV.      | 2            |
| REV.      | 2            |

| LTC3882EUJ |                           |
|------------|---------------------------|
| IC NO.     | DC2291A                   |
| DATE       | Monday, November 30, 2015 |
| SHEET      | 2 OF 4                    |

# DEMO MANUAL DC2291A



**CUSTOMER NOTICE**  
 LINAER TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A DEMO BOARD. THE USER ASSUMES THE RESPONSIBILITY TO VERIFY THE BOARD DESIGN AND TO PROVIDE THE APPROPRIATE APPLICATION. CUSTOMERS IN INDUSTRIAL AND AUTOMOTIVE APPLICATIONS SHOULD CONTACT LINAER TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

**APPROVALS**  
 PCB DES: KZ  
 APP SIG: HADAWAL

**SIZE**: N/A  
**SCALE**: NONE

**DATE**: Monday, November 30, 2015

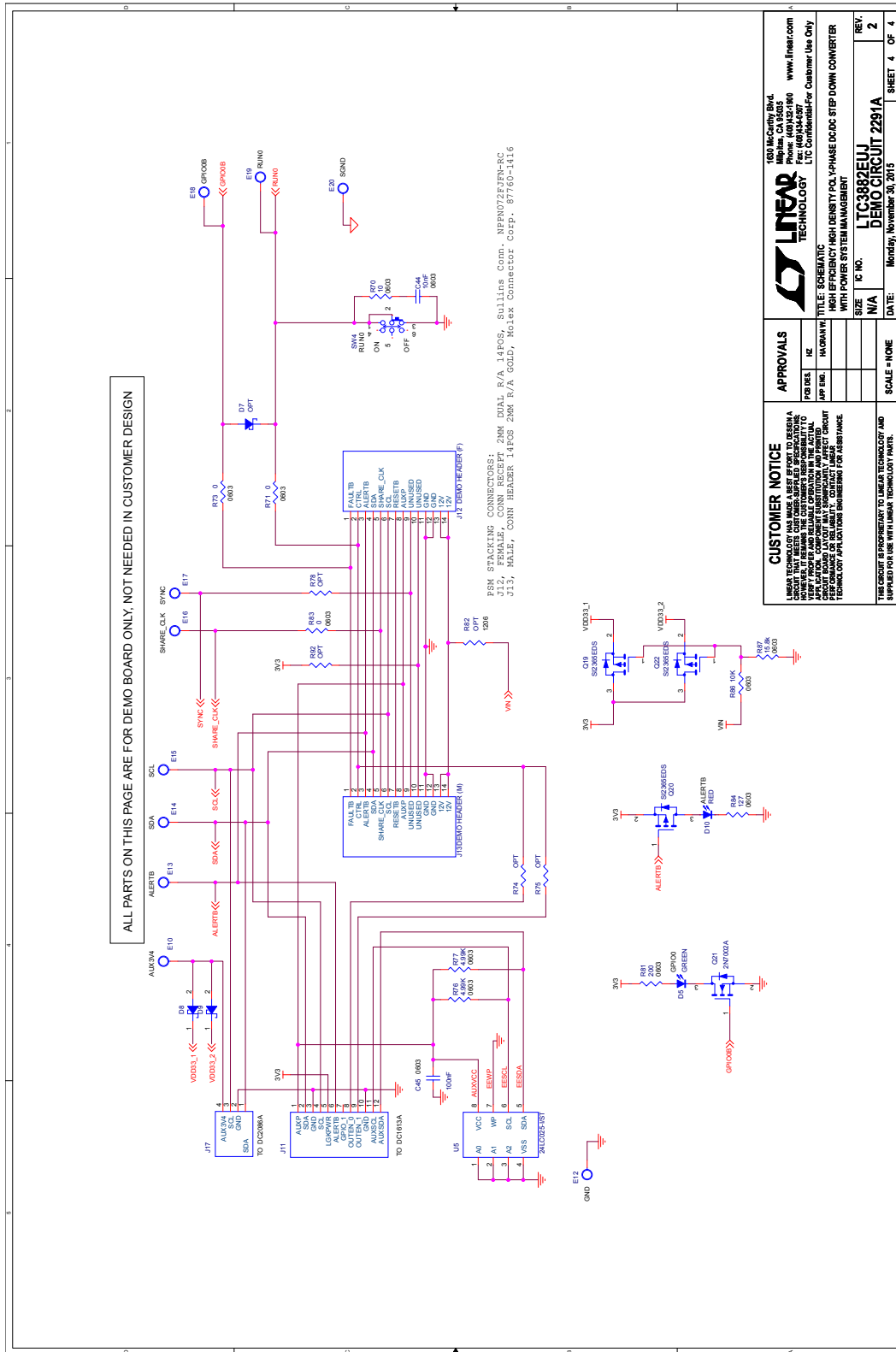
**IC NO.**: LTC3822E  
**DEMO CIRCUIT**: 2291A

**REV.**: 2  
**SHEET**: 3 OF 4

**LINEAR TECHNOLOGY**  
 1635 McCarthy Blvd.  
 Milpitas, CA 95035  
 Phone: (408)433-8000  
 Fax: (408)433-8001  
 www.linear.com  
 L.T.'s Confidential For Customer Use Only

**TITLE**: SCHEMATIC  
**WITH POWER SYSTEM MANAGEMENT**







# DEMO MANUAL DC2291A

---

## DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

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.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

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.

Mailing Address:

Linear Technology  
1630 McCarthy Blvd.  
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation