

LTC3887EUJ Dual Phase Step-Down DC/DC Controller with Digital Power System Management

DESCRIPTION

Demonstration circuit 2263A is a high current, high efficiency, synchronous buck converter featuring the [LTC®3887EUJ](#), a dual-phase current mode controller. The LTC3887 has the PMBus interface and power system management functions.

The DC2263A uses discrete MOSFETs in the power stage. The input range of this board is from 7V to 14V. The output voltage can be programmed from 0.8V to 1.8V with an output current up to 25A per phase. The DC2263A has two versions: The DC2263A-A uses a sense resistor and provides two outputs while the DC2263A-B uses DCR current sensing and provides a dual-phase single output. The factory default setting for the output voltage is 1.0V. The DC2263A also has an onboard dynamic load circuit, which makes it easy for the customer to evaluate the transient performances.

The DC2263A 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 LTC3887. 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

For more details and instructions along with downloading LTpowerPlay, go to the following link.

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

Design files for this circuit board are available at
<http://www.linear.com/demo/DC2263A>

LT, LT, LTC, LTM, Linear Technology, the Linear logo 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_A = 25°C

DC2263A-A Assembly (Dual Output)

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------|---------------------------|--|-----|------|-----|-------|
| V _{IN} | Input Supply Range | | 7 | 12 | 14 | V |
| F _{SW} | Factory Default Switching | | | 425 | | kHz |
| V _{OUT0} | CH0 Output Voltage Range | I _{OUT0} = 0A TO 25A, V _{IN} = 7.0V to 14V | 0.8 | 1.0 | 1.8 | V |
| I _{OUT0} | CH0 Output Current Range | | 0 | | 25 | A |
| EFF | CH0 Peak Efficiency | V _{OUT0} = 1.0V, See Figures 4 | | 86.5 | | % |
| V _{OUT1} | CH1 Output Voltage Range | I _{OUT1} = 0A TO 25A, V _{IN} = 7.0V to 14V | 0.8 | 1.0 | 1.8 | V |
| I _{OUT1} | CH1 Output Current Range | | 0 | | 25 | A |
| EFF | CH1 Peak Efficiency | V _{OUT1} = 1.0V, See Figures 4 | | 86.5 | | % |

DC2263A-B Assembly (Single Output)

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------|---------------------------|---|-----|------|-----|-------|
| V _{IN} | Input Supply Range | | 7 | 12 | 14 | V |
| V _{OUT0} | Output Voltage Range | I _{OUT} = 0A TO 50A, V _{IN} = 7.0V to 14V | 0.8 | 1.0 | 1.8 | V |
| I _{OUT0} | Output Current Range | | 0 | | 50 | A |
| F _{SW} | Factory Default Switching | | | 425 | | kHz |
| EFF | Peak Efficiency | V _{OUT} = 1.0V, See Figures 5 | | 87.8 | | % |

dc2263afa

DEMO MANUAL

DC2263A-A/DC2263A-B

QUICK START PROCEDURE

Demonstration circuit 2263A makes it easy to set up to evaluate the performances of the LTC3887. 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 C34 for CH0 and C32 for CH1. See Figure 3 for proper scope probe technique.

1. Make sure jumpers are in the following positions:

| JUMPER | POSITION | FUNCTION |
|--------|---------------------|------------------|
| JP1 | C | GPIO0B to GPIO1B |
| JP2 | NC for -A, C for -B | RUN0 to RUN1 |
| JP3 | OFF | EXTVCC_DRV |

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 SW1 (for RUN0), and SW2 (for RUN1) switches as desired.
6. Check for the correct output voltage from TP4 to TP16 for CH0, TP3 to TP20 for CH1. $V_{OUT0}/V_{OUT1} = 1.0V \pm 0.5\%$ (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 DC2263A

You can use a PC to reconfigure the power management features of the LTC3887 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.

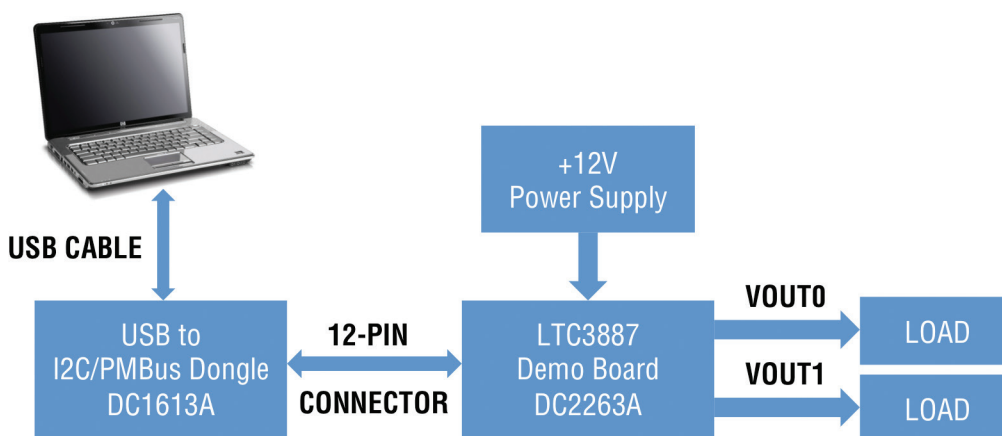


Figure 1. Demo Setup with PC

QUICK START PROCEDURE

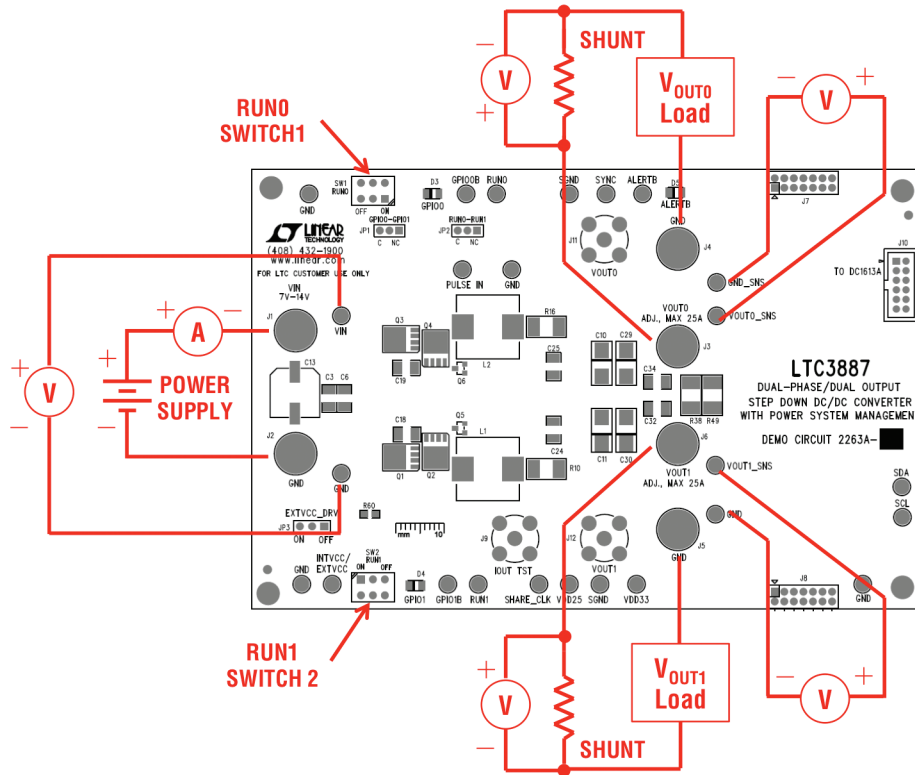


Figure 2. Power Test Setup

Measuring Efficiency

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

- Set JP3 to OFF position to disable the auxiliary circuits.
- DC2263A-A version. Measure V_{IN} across the input ceramic capacitor (C19 for CH0, C18 for CH1). Measure V_{OUT} across the output ceramic capacitor (C25 for CH0, C24 for CH1).

- DC2263A-B version. Measure V_{IN} across the input ceramic capacitor C19. Measure V_{OUT} across the output ceramic capacitor C25.

Measuring Output Ripple Voltage

An accurate ripple measurement may be performed by using the configuration across C34 as shown in Figure 3.

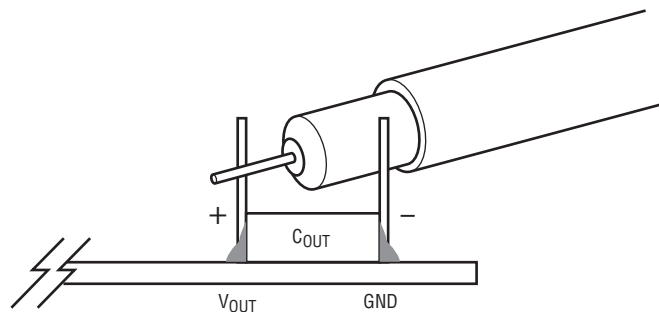


Figure 3. Measuring Output Voltage Ripple

QUICK START PROCEDURE

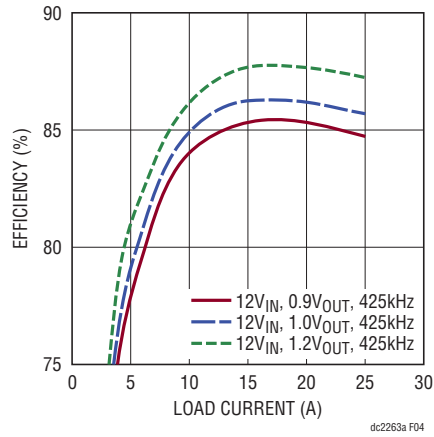


Figure 4. Typical Efficiency Curves DC2263A-A, $f_{sw} = 425\text{kHz}$

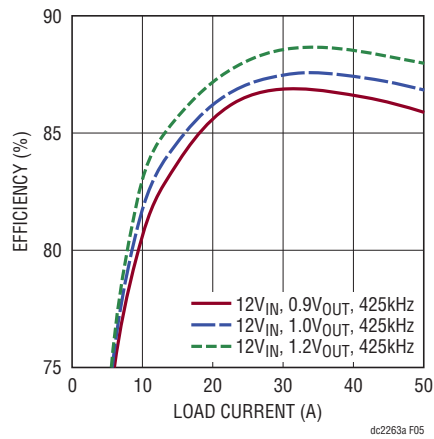


Figure 5. Typical Efficiency Curves DC2263A-B, $f_{sw} = 425\text{kHz}$

LTpowerPlay SOFTWARE GUI

LTpowerPlay is a powerful Windows based development environment that supports Linear Technology power system management ICs, including the LTC3880, LTC3883, LTC3882 and LTC3887. 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 LTC3887's DC2263A 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.

DEMO MANUAL DC2263A-A/DC2263A-B

LTpowerPlay QUICK START PROCEDURE

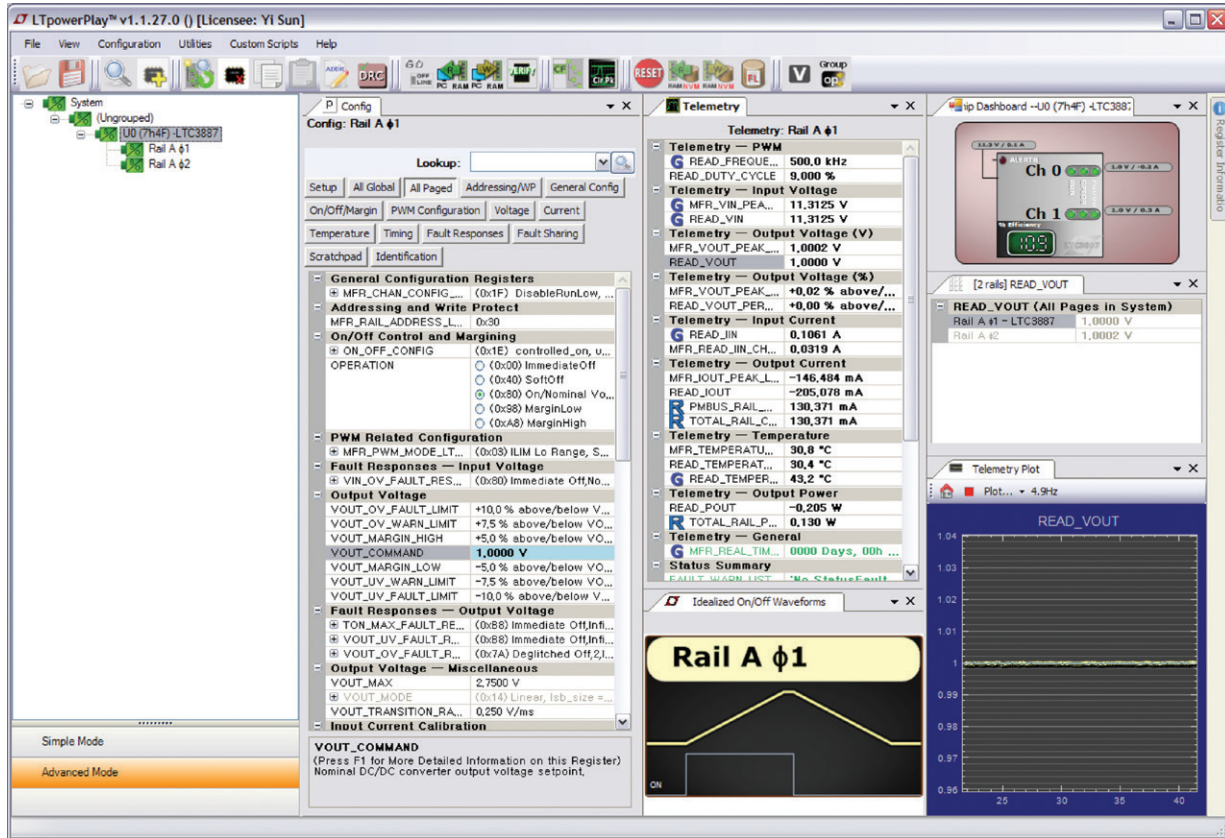
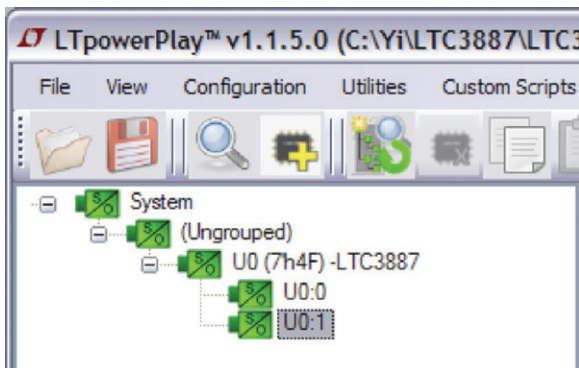


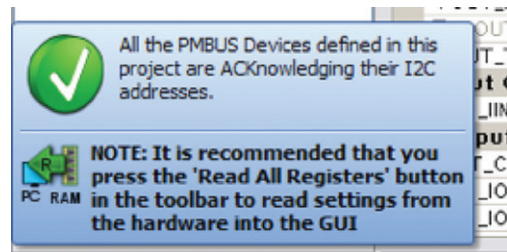
Figure 6. LTpowerPlay Main Interface

The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTC3887.

1. Download and install the LTpowerPlay GUI:
<http://www.linear.com/ltpowerplay>
2. Launch the LTpowerPlay GUI.
 - a. The GUI should automatically identify the DC2263A. 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 LTC3887 is communicating:

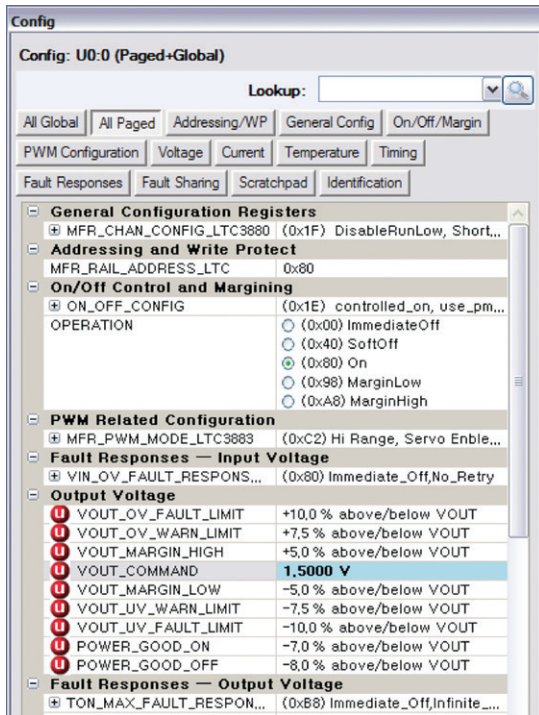


- c. In the Toolbar, click the “R” (RAM to PC) icon to read the RAM from the LTC3887. This reads the configuration from the RAM of LTC3887 and loads it into the GUI.



LTpowerPlay QUICK START PROCEDURE

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 LTC3887. 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 with a new filename.

DEMO MANUAL

DC2263A-A/DC2263A-B

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----|---|-----------------------------------|--|
| Required Circuit Components: DC2063A-A | | | | |
| 1 | 2 | C1, C2 | CAP., X5R, 100nF, 25V, 10%, 0603 | AVX, 06033C104KAT2A |
| 2 | 2 | C21, C22 | CAP., X7R 1nF 50V 0603 | AVX 06035C102KAT2A |
| 3 | 1 | C5 | CAP., 4.7µF, X5R, 25V, 10%, 0805 | AVX, 08053D475KAT2A |
| 4 | 1 | C9 | CAP., X5R, 1µF, 25V, 10%, 0603 | AVX, 06033D105KAT2A |
| 5 | 4 | C10, C11, C29, C30 | CAP., POSCAP 330µF 6V D3L | PANASONIC, 6TPF330M9L |
| 6 | 2 | C12, C14 | CAP., X5R, 10nF, 16V, 10%, 0603 | AVX, 0603YC103KAT2A |
| 7 | 1 | C13 | CAP., OS-CON, 150µF, 35V | SUN ELECTRONIC INDUSTRIES CORP., 35HVP150M |
| 8 | 2 | C15, C16 | CAP., X7R 47pF 5% 50V 0603 | AVX, 06035C470JAT2A |
| 9 | 2 | C7, C8 | CAP., C0G, 3300pF, 50V, 5%, 0603 | KEMET, C0603C332J5GACTU |
| 10 | 1 | C17 | CAP., 0.22µF, X7R, 16V, 10%, 0603 | AVX, 0603YC224KAT2A |
| 11 | 4 | C18, C19, C27, C28 | CAP., 22µF, X5R, 25V, 20%, 1210 | AVX, 12103D226MAT2A |
| 12 | 6 | C20, C23, C24, C25, C32, C34 | CAP., X5R, 100µF, 6.3V, 20%, 1210 | AVX 12106D107MAT2A |
| 13 | 1 | C48 | CAP., X5R, 4.7µF, 16V, 10%, 0603 | TDK C1608X5R1C475K |
| 14 | 2 | D1, D2 | DIODE, SCHOTTKY, SOD-323 | CENTRAL SEMI., CMDSH-3TR |
| 15 | 2 | L1, L2 | IND, 0.22µH | WURTH ELEKTRONIK, 744305022 |
| 16 | 2 | Q1, Q3 | XSTR, POWER MOSFET LPAK | INFINEON, BSC050NE2LS |
| 17 | 4 | Q2, Q4 | XSTR, POWER MOSFET LPAK | INFINEON, BSC010NE2LSI |
| 18 | 9 | R8, R9, , R25, R45, R6, R29, R30, R34, R71, R76 | RES., CHIP, 0Ω, 1% 0603 | NIC, NRC06Z0TRF |
| 19 | 11 | R27, R28, R39, R40, R41, R42, R43, R44, R57 | RES., CHIP, 10k, 1% 0603 | NIC, NRC06F1002TRF |
| 20 | 3 | R52, R56, R59 | RES., CHIP, 2Ω, 1%, 0603 | NIC, NRC06F2R00TRF |
| 21 | 2 | R3, R4 | RES., CHIP, 6.49k, 1% 0603 | NIC, NRC06F6491TRF |
| 22 | 2 | R10, R16 | RES SENSE., CHIP, 0.001Ω, 1% 2512 | VISHAY, WSL25121L000FEA |
| 23 | 4 | R11, R12, R13, R14 | RES., CHIP, 100Ω, 1% 0603 | NIC NRC06F1000TRF |
| 24 | 1 | U1 | IC, LTC3887EUJ, QFN 6mm × 6mm | LINEAR TECH.LTC3887EUJ#10C9-1PBF-ES |
| Additional Demo Board Circuit Components | | | | |
| 1 | 1 | C31 | CAP., X5R, 100nF, 25V, 10%, 0603 | AVX, 06033C104KAT2A |
| 2 | 0 | C3, C6, C35, C36 | CAP., OPT 1210 | OPT |
| 3 | 2 | C26, C33 | CAP., X5R, 10nF, 16V, 10%, 0603 | AVX, 0603YC103KAT2A |
| 4 | 0 | C4, C38 | CAP., OPT 0603 | OPT |
| 5 | 1 | C40 | CAP., X7R, 1µF, 50V, 10%, 1206 | AVX 12065C105KAT2A |
| 6 | 2 | C41, C47 | CAP., X5R, 2.2µF, 50V, 10%, 0805 | MURATA GRM21BR61H225KA73L |
| 7 | 0 | C42, C43, C44, C45 | CAP., POSCAP OPT D3L | OPT |
| 8 | 1 | C49 | CAP., X5R, 4.7µF, 16V, 10%, 0603 | TDK C1608X5R1C475K |
| 9 | 1 | C54 | CAP., X7R, 1µF, 16V, 10%, 0805 | MURATA GRM21BR71C105KA01L |
| 10 | 2 | D3, D4 | LED 3×2mm 560nm GRN WTR CLR SMD | ROHM, SML-010FTT86 |
| 11 | 1 | D5 | LED 3×2mm 650nm RED WTR CLR SMD | ROHM, SML-010VTT86 |
| 12 | 0 | D6, D7 | LED OPT SOD-323 | OPT |
| 13 | 2 | Q5, Q6 | TRANS GP SS PNP 40V SOT23 | ON SEMI, MMBT3906LT1G |
| 14 | 0 | Q7, Q8 | OPT | OPT |

dc2263afa

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|---|-----------------------------------|---------------------------|
| 15 | 2 | Q12, Q13 | MOSFET N-CH 60V 115MA SOT23 | FAIRCHILD, 2N7002 |
| 16 | 2 | Q14, Q19 | MOSFET P-CH 20V 0.58A SOT23 | VISHAY, SI2365EDS-T1-GE3 |
| 17 | 1 | Q15 | MOSFET SPEED SRS 30V 30A LFPK | RENESAS, RJK0305DPB-00#J0 |
| 18 | 0 | R5, R33, R62, R77, R81, R82, R84, R86, R96, R1, R2, R7, R15, R26, R69, R17, R18, R19, R20, R21, R22, R23, R24, R32, R67, R73, R74 | RES., OPT 0603 | OPT |
| 19 | 3 | R51, R79, R80 | RES., CHIP, 0Ω, 1% 0603 | NIC, NRC06ZOTRF |
| 20 | 2 | R58, R92 | RES., CHIP, 10k, 1% 0603 | NIC, NRC06F1002TRF |
| 21 | 2 | R36, R37 | RES., CHIP, 4.99k, 1%, 0603 | NIC, NRC06F4991TRF |
| 22 | 2 | R53, R54 | RES., CHIP, 200Ω, 1% 0603 | NIC, NRC06F2000TRF |
| 23 | 1 | R55 | RES., CHIP, 127Ω, 1%, 0603 | NIC, NRC06F1270TRF |
| 24 | 0 | R60 | RES., OPT 0805 | OPT |
| 25 | 1 | R61 | RES., CHIP, 100k, 1% 0603 | NIC NRC06F1003TRF |
| 26 | 2 | R63, R64 | RES., CHIP, 10Ω, 1% 0603 | NIC NRC06F10R0TRF |
| 27 | 1 | R68 | RES SENSE., CHIP, 0.01Ω, 1% 2512 | VISHAY, WSL2512R0100FEA |
| 28 | 1 | R93 | RES., CHIP, 15.8k, 1% 0603 | NIC, NRC06F1582TRF |
| 29 | 0 | R100 | RES SENSE., OPT 2512 | OPT |
| 30 | 1 | R101 | RES SENSE., CHIP, 0Ω, 1%, 1W 2512 | VISHAY WSL251200000ZEA9 |
| 31 | 4 | R38, R46, R49, R50 | RES SENSE., OPT 2512 | OPT |
| 32 | 1 | U2 | IC, 24LC05-I/ST TSSOP-8_4.4mm | MICROCHIP, 24LC025-I/ST |
| 33 | 1 | U3 | IC, LT1129CS8-5, SO8NB | LINEAR TECH, LT1129CS8-5 |

Hardware: For Demo Board Only

| | | | | |
|----|---|------------------------|--|-------------------------------|
| 1 | 2 | JP1, JP2 | HEADER, 1×3 2mm | SULLIN, NRPN031PAEN-RC |
| 2 | 2 | XJP1, XJP2 | SHUNT, 2mm | SAMTEC 2SN-BK-G |
| 3 | 1 | JP3 | HEADER, 1×3 0.1" | WURTH ELEKTRONIK, 61300311121 |
| 4 | 1 | XJP3 | SHUNT, 0.1" BLK | WURTH ELEKTRONIK, 60900213421 |
| 5 | 6 | J1, J2, J3, J4, J5, J6 | CONN., JACK, BANANA, NON-INSULATED, 0.218" | KEYSTONE, 575-4 |
| 6 | 1 | J7 | CONN., HEADER, 2×7, 2mm, R/A (F) | SULLINS, NPPN072FJFN-RC |
| 7 | 1 | J8 | CONN., HEADER, 2×7, 2mm, R/A (M) | MOLEX, 87760-1416 |
| 8 | 3 | J9, J11, J12 | CONN., BNC PC MOUNT RECEPT. JACK, 50Ω, TF-4 POST | AMPHENOL CONNEX, 112404 |
| 9 | 1 | J10 | HEADER, 2×6 2mm STR DL PCB | FCI 98414-G06-12ULF |
| 10 | 4 | STAND-OFF | STAND-OFF, NYLON 0.50" TALL | KEYSTONE, 8833(SNAP ON) |
| 11 | 2 | | STENCILS TOP AND BOTTOM | STENCIL DC2263A |

DEMO MANUAL

DC2263A-A/DC2263A-B

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----|---|--|-------------------------------------|
| Required Circuit Components: DC2063A-B | | | | |
| 1 | 2 | C1, C2 | CAP., X5R, 100nF, 25V, 10%, 0603 | AVX, 06033C104KAT2A |
| 2 | 1 | C5 | CAP., X5R, 4.7µF, 25V 0805 | AVX, 08053D475KAT2A |
| 3 | 1 | C9 | CAP., X5R, 1µF, 25V, 10%, 0603 | AVX, 06033D105KAT2A |
| 4 | 2 | C4, C38 | CAP., X5R 1µF 25V 10% 0603 | MURATA GRM188R61E105KA12D |
| 5 | 1 | C8 | CAP., C0G, 3300pF, 50V, 5%, 0603 | KEMET, C0603C332J5GACTU |
| 6 | 4 | C10, C11, C29, C30 | CAP., POSCAP 330µF 6V D3L | PANASONIC, 6TPF330M9L |
| 7 | 2 | C12, C14 | CAP., X5R, 10nF, 16V, 10%, 0603 | AVX, 0603YC103KAT2A |
| 8 | 1 | C13 | CAP., OS-CON, 150µF, 35V | SUNCON, 35HVP150M |
| 9 | 2 | C15, C16 | CAP., 47PF, X7R, 50V, 5%, 0603 | AVX, 06035C470JAT2A |
| 10 | 1 | C17, C21, C22 | CAP., 0.22µF, X7R, 16V, 10%, 0603 | AVX, 0603YC224KAT2A |
| 11 | 4 | C18, C19, C27, C28 | CAP., 22µF, X5R, 25V, 20%, 1210 | AVX, 12103D226MAT2A |
| 12 | 6 | C20, C23, C24, C25, C32, C34 | CAP., X5R, 100µF, 6.3V, 20%, 1210 | AVX 12106D107MAT2A |
| 13 | 1 | C48 | CAP., X5R, 4.7µF, 16V, 10%, 0603 | TDK C1608X5R1C475K |
| 15 | 2 | D1, D2 | DIODE, SCHOTTKY, SOD-323 | CENTRAL SEMI., CMDSH-3TR |
| 16 | 2 | L1, L2 | IND, 0.19µH | WURTH ELECTRONIC, 744355019 |
| 17 | 2 | Q1, Q3 | XSTR, POWER MOSFET LPAK | INFINEON, BSC050NE2LS |
| 18 | 4 | Q2, Q4 | XSTR, POWER MOSFET LPAK | INFINEON, BSC010NE2LSI |
| 19 | 9 | R8, R9, R25, R45, R7, R15, R26, R69, R71, R76 | RES., 0Ω, 0603 | NIC, NRC06Z0TRF |
| 20 | 4 | R1, R2, R12, R14 | RES., 845Ω, 1% , 0603 | NIC NRC06F8450TRF |
| 21 | 1 | R3 | RES., 3.32k, 1%, 0603 | NIC, NRC06F3321TRF |
| 22 | 11 | R27, R28, R39, R40, R41, R42, R43, R44, R57 | RES., CHIP, 10k, 1% 0603 RES., 10k, 1%, 0603 | NIC, NRC06F1002TRF |
| 23 | 3 | R52, R56, R59 | RES., CHIP, 2, 1%, 0603 | YAGEO, RC0603FR-072RL |
| 24 | 6 | R10, R16, R38, R46, R49, R50 | RES SENSE., CHIP, 0, 1%, 1W 2512 | VISHAY WSL251200000ZEA9 |
| 26 | 1 | U1 | IC, LTC3887EUJ, QFN 6mm × 6mm | LINEAR TECH.LTC3887EUJ#10CA-1PBF-ES |
| Additional Demo Board Circuit Components | | | | |
| 1 | 1 | C31 | CAP., X5R, 100nF, 25V, 10%, 0603 | AVX, 06033C104KAT2A |
| 2 | 0 | C3, C6, C35, C36 | CAP., OPT 1210 | OPT |
| 3 | 2 | C26, C33 | CAP., X5R, 10nF, 16V, 10%, 0603 | AVX, 0603YC103KAT2A |
| 4 | 0 | C7 | CAP., OPT 0603 | OPT |
| 5 | 1 | C40 | CAP., X7R, 1µF, 50V, 10%, 1206 | AVX 12065C105KAT2A |
| 6 | 2 | C41, C47 | CAP., X5R, 2.2µF, 50V, 10%, 0805 | MURATA GRM21BR61H225KA73L |
| 7 | 0 | C42, C43, C44, C45 | CAP., POSCAP OPT D3L | OPT |
| 8 | 1 | C49 | CAP., X5R, 4.7µF, 16V, 10%, 0603 | TDK C1608X5R1C475K |
| 9 | 1 | C54 | CAP., X7R, 1µF, 16V, 10%, 0805 | MURATA GRM21BR71C105KA01L |
| 10 | 2 | D3, D4 | LED 3×2mm 560nm GRN WTR CLR SMD | ROHM, SML-010FTT86 |
| 11 | 1 | D5 | LED 3×2mm 650nm RED WTR CLR SMD | ROHM, SML-010VTT86 |
| 12 | 0 | D6, D7 | LED OPT SOD-323 | OPT |
| 13 | 2 | Q5, Q6 | TRANS GP SS PNP 40V SOT23 | ON SEMI, MMBT3906LT1G |
| 14 | 0 | Q7, Q8 | OPT | OPT |

dc2263afa

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|---|-----------------------------------|---------------------------|
| 15 | 2 | Q12, Q13 | MOSFET N-CH 60V 115MA SOT23 | FAIRCHILD, 2N7002 |
| 16 | 2 | Q14, Q19 | MOSFET P-CH 20V 0.58A SOT23 | VISHAY, SI2365EDS-T1-GE3 |
| 17 | 1 | Q15 | MOSFET SPEED SRS 30V 30A LFPK | RENESAS, RJK0305DPB-00#J0 |
| 18 | 0 | R5, R33, R62, R77, R81, R82, R84, R86, R96, R4, R6, R11, R13, R29, R30, R34, R17, R18, R19, R20, R21, R22, R23, R24, R32, R67, R73, R74 | RES., OPT 0603 | OPT |
| 19 | 3 | R51, R79, R80 | RES., 0Ω, 0603 | NIC, NRC06ZOTRF |
| 20 | 2 | R58, R92 | RES., 10k, 1%, 0603 | NIC, NRC06F1002TRF |
| 21 | 2 | R36, R37 | RES., CHIP, 4.99k, 1%, 0603 | NIC, NRC06F4991TRF |
| 22 | 2 | R53, R54 | RES., CHIP, 200Ω, 1% 0603 | NIC, NRC06F2000TRF |
| 23 | 1 | R55 | RES., CHIP, 127Ω, 1%, 0603 | NIC, NRC06F1270TRF |
| 24 | 0 | R60 | RES., OPT 0805 | OPT |
| 25 | 1 | R61 | RES., CHIP, 100k, 1% 0603 | NIC NRC06F1003TRF |
| 26 | 2 | R63, R64 | RES., CHIP, 10Ω, 1% 0603 | NIC NRC06F10R0TRF |
| 27 | 1 | R68 | RES SENSE., CHIP, 0.01Ω, 1% 2512 | VISHAY, WSL2512R0100FEA |
| 28 | 1 | R93 | RES., CHIP, 15.8k, 1% 0603 | NIC, NRC06F1582TRF |
| 29 | 0 | R100 | RES SENSE., OPT 2512 | OPT |
| 30 | 1 | R101 | RES SENSE., CHIP, 0Ω, 1%, 1W 2512 | VISHAY WSL251200000ZEA9 |
| 31 | 1 | U2 | IC, 24LC05-I/ST TSSOP-8_4.4mm | MICROCHIP, 24LC025-I/ST |
| 32 | 1 | U3 | IC, LT1129CS8-5, SO8NB | LINEAR TECH, LT1129CS8-5 |

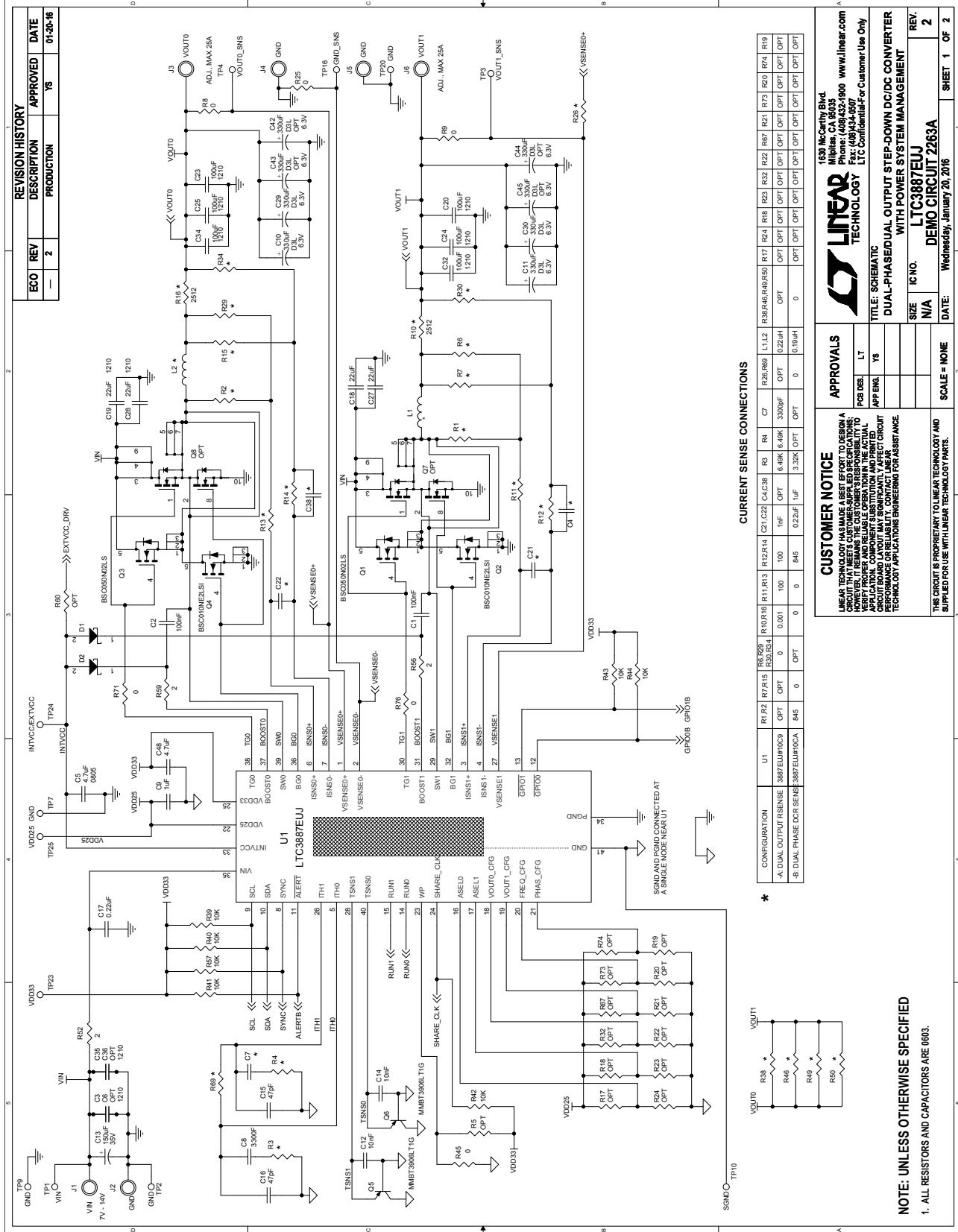
Hardware: For Demo Board Only

| | | | | |
|----|---|------------------------|--|-------------------------------|
| 1 | 2 | JP1, JP2 | HEADER, 1×3 2mm | SULLIN, NRPN031PAEN-RC |
| 2 | 2 | XJP1, XJP2 | SHUNT, 2mm | SAMTEC 2SN-BK-G |
| 3 | 1 | JP3 | HEADER, 1×3 0.1" | WURTH ELEKTRONIK, 61300311121 |
| 4 | 1 | XJP3 | SHUNT, 0.1" BLK | WURTH ELEKTRONIK, 60900213421 |
| 5 | 6 | J1, J2, J3, J4, J5, J6 | CONN., JACK, BANANA, NON-INSULATED, 0.218" | KEYSTONE, 575-4 |
| 6 | 1 | J7 | CONN., HEADER, 2×7, 2mm, R/A (F) | SULLINS, NPPN072FJFN-RC |
| 7 | 1 | J8 | CONN., HEADER, 2×7, 2mm, R/A (M) | MOLEX, 87760-1416 |
| 8 | 3 | J9, J11, J12 | CONN., BNC PC MOUNT RECEPT. JACK, 50Ω, TF-4 POST | AMPHENOL CONNEX, 112404 |
| 9 | 1 | J10 | HEADER, 2×6 2mm STR DL PCB | FCI 98414-G06-12ULF |
| 10 | 4 | STAND-OFF | STAND-OFF, NYLON 0.50" TALL | KEYSTONE, 8833(SNAP ON) |
| 11 | 2 | | STENCILS TOP AND BOTTOM | STENCIL DC2263A |

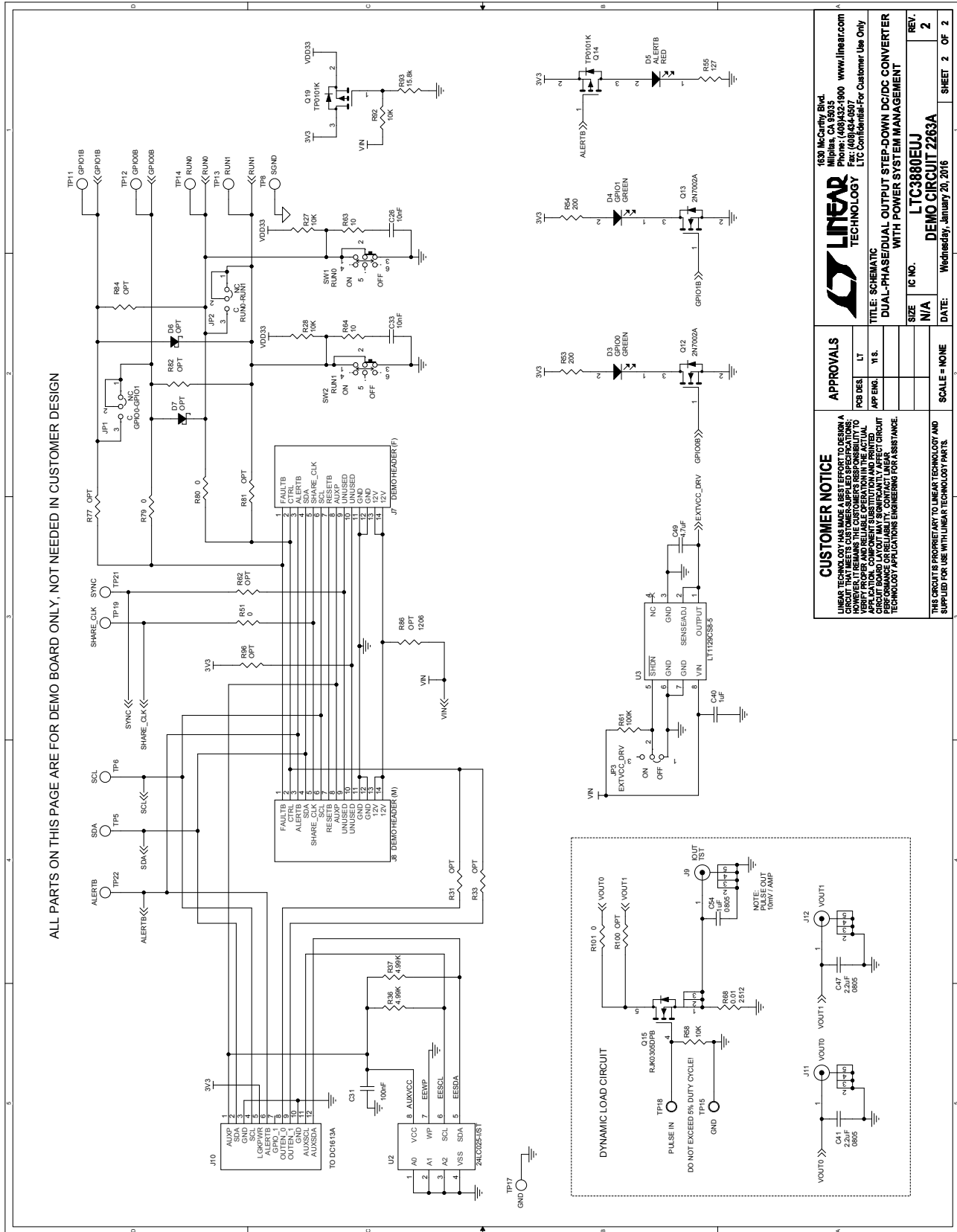
DEMO MANUAL

DC2263A-A/DC2263A-B

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



dc2263afa

DEMO MANUAL

DC2263A-A/DC2263A-B

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