

# LTC3850EUF

## Dual Phase/Dual Output Synchronous Buck Converter

### DESCRIPTION

Demonstration circuit 1185 is a dual phase/dual output synchronous buck converter featuring the [LTC3850EUF](#). The demo board comes in two versions. The output voltages for version DC1185B-A are 2.0V/10A and 1.8V/10A. The output voltages for version DC1185B-B are 1.5V/15A and 1.2V/15A. The input voltage range is 6.5V to 14V for both versions. For applications that have a 5V  $\pm$ 0.5V input, the board has an optional resistor to tie the INTVCC pin to the VIN pin.

The demo board uses a high density, 2-sided drop-in layout. The power components excluding the bulk output and input capacitors, fit within a 1.35"  $\times$  0.75" area on the top layer. The control circuit resides in a 0.60"  $\times$  0.75" area on the bottom layer. The package style for the LTC3850EUF is a 4mm  $\times$  4mm 28-lead QFN with an exposed ground pad.

The main features of the board include an internal 5V linear regulator for bias, RUN pins for each output, an EXTVCC pin and a PGOOD signal. The board can be configured for either CCM (original setting), Burst Mode<sup>®</sup>, or pulse-skipping operation with the MODE jumper. The board also has optional resistors for single output/dual phase operation, rail tracking, DCR sensing and synchronization to an external clock.

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

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**Note:** Q1-Q4 MOSFETs changed on September 10, 2013. See Schematic Diagram.

### PERFORMANCE SUMMARY

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

| PARAMETER                                                    | CONDITION                                                                                                                                            | VALUE          |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Minimum Input Voltage                                        |                                                                                                                                                      | 6.5V           |
| Maximum Input Voltage                                        |                                                                                                                                                      | 14V            |
| <b>Version DC1185B-A</b>                                     |                                                                                                                                                      |                |
| Output Voltage V <sub>OUT1</sub>                             | I <sub>OUT1</sub> = 0A to 10A                                                                                                                        | 2.0V $\pm$ 2%  |
| Output Voltage V <sub>OUT2</sub>                             | I <sub>OUT2</sub> = 0A to 10A                                                                                                                        | 1.8V $\pm$ 2%  |
| Nominal Switching Frequency                                  |                                                                                                                                                      | 500kHz         |
| Full-Load Efficiency<br>(See Figure 3 for Efficiency Curves) | V <sub>OUT1</sub> = 2.0V, I <sub>OUT1</sub> = 10A, V <sub>IN</sub> = 12V<br>V <sub>OUT2</sub> = 1.8V, I <sub>OUT2</sub> = 10A, V <sub>IN</sub> = 12V | 90.2%<br>89.5% |
| <b>Version DC1185B-B</b>                                     |                                                                                                                                                      |                |
| Output Voltage V <sub>OUT1</sub>                             | I <sub>OUT1</sub> = 0A to 15A                                                                                                                        | 1.5V $\pm$ 2%  |
| Output Voltage V <sub>OUT2</sub>                             | I <sub>OUT2</sub> = 0A to 15A                                                                                                                        | 1.2V $\pm$ 2%  |
| Nominal Switching Frequency                                  |                                                                                                                                                      | 400kHz         |
| Full-Load Efficiency<br>(See Figure 4 for Efficiency Curves) | V <sub>OUT1</sub> = 1.5V, I <sub>OUT1</sub> = 15A, V <sub>IN</sub> = 12V<br>V <sub>OUT2</sub> = 1.2V, I <sub>OUT2</sub> = 15A, V <sub>IN</sub> = 12V | 88.1%<br>86.5% |

# DEMO MANUAL

## DC1185B-A/-B

### QUICK START PROCEDURE

Demonstration circuit 1185 is easy to set up to evaluate the performance of the LTC3850EUF. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

Note: When measuring the output or input voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. See Figure 2 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.

Place jumpers in the following positions:

|     |      |     |
|-----|------|-----|
| JP1 | RUN1 | ON  |
| JP2 | RUN2 | ON  |
| JP3 | MODE | CCM |

With power off, connect the input power supply to VIN and GND.

Turn on the power at the input.

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

Check for the proper output voltages.

Version DC1158B-A:

$$V_{OUT1} = 1.960V \text{ to } 2.040V$$

$$V_{OUT2} = 1.764V \text{ to } 1.836V$$

Version DC1158B-B:

$$V_{OUT1} = 1.470V \text{ to } 1.530V$$

$$V_{OUT2} = 1.176V \text{ to } 1.224V$$

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

Note: Do not apply load across the  $VOSn+$  and  $VOSn-$  turrets. These turrets are only intended to Kelvin sense the output voltage across COUT1 and COUT4. Heavy load currents may damage the output voltage sense traces.

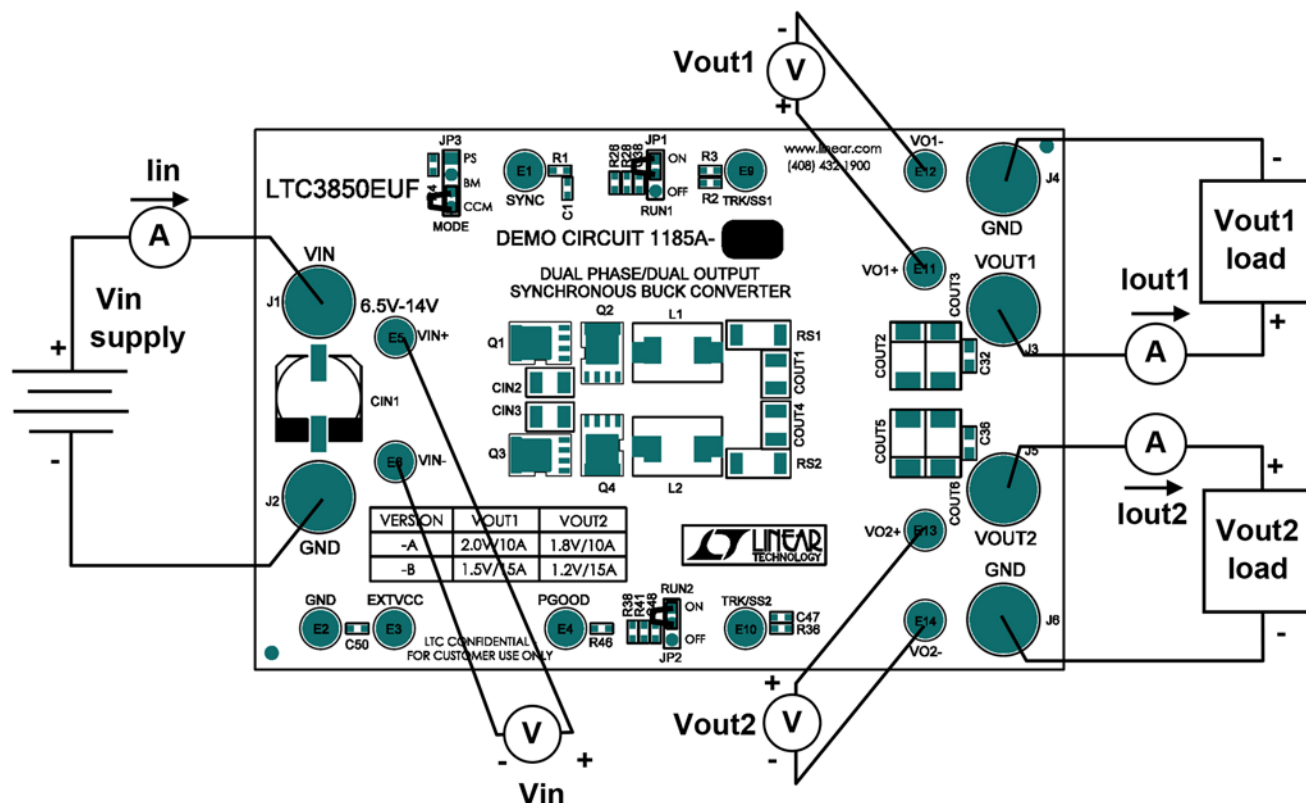


Figure 1. Proper Measurement Equipment Setup

dc1185b-a/-bf

### QUICK START PROCEDURE

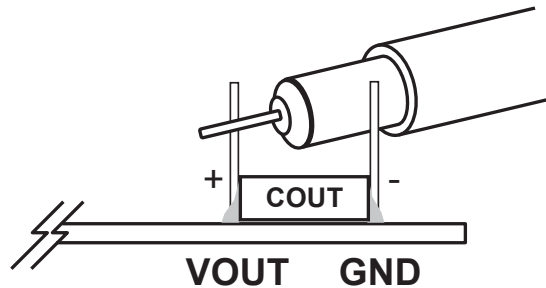


Figure 2. Measuring Output Voltage Ripple

2.0V/10A and 1.8V/10A Efficiency at  $V_{IN} = 12V$  and  $f_{SW} = 500kHz$

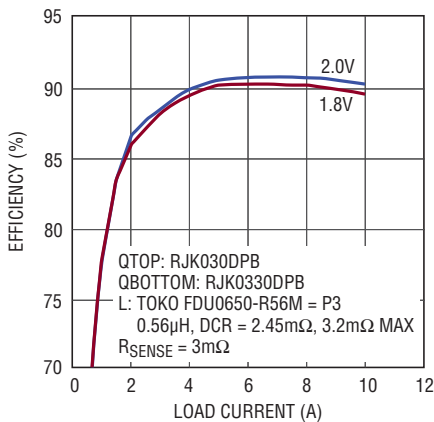


Figure 3. Efficiency Curves for the DC1185B-A

1.5V/15A and 1.2V/15A Efficiency at  $V_{IN} = 12V$  and  $f_{SW} = 400kHz$

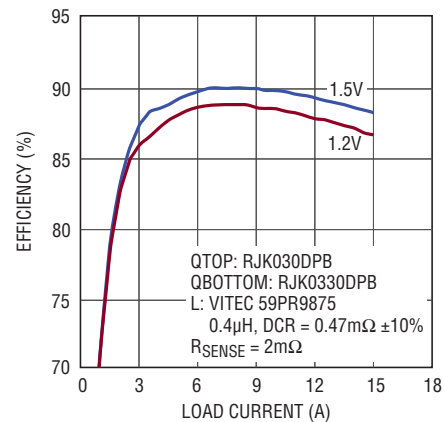


Figure 4. Efficiency Curves for the DC1185B-B

### SINGLE OUTPUT/DUAL PHASE OPERATION

A single output/dual phase converter may be preferred for high output current applications. The benefits of single output/dual phase operation is lower ripple current through the input and output capacitors, improved load step response and simplified thermal design. To implement single output/dual phase operation, make the following modifications:

1. Tie VOUT1 to VOUT2 by tying together the exposed copper pads near J3 and J5 at the edge of the board. Use a piece of heavy copper foil.
2. Tie ITH1 to ITH2 by stuffing 0Ω at R49.
3. Tie VFB1 to VFB2 by stuffing 0Ω at R50.
4. Tie TRK/SS1 to TRK/SS2 by stuffing 0Ω at R52.
5. Tie RUN1 to RUN2 by stuffing 0Ω at R55.
6. Remove the redundant ITH compensation network and VFB divider.

### RAIL TRACKING

Demonstration circuit 1185 is set up for independent turn-on of VOUT1 and VOUT2. The ramp-rate for VOUT1 is determined by the TRK/SS1 capacitor at C2 and the ramp-rate for VOUT2 is determined by the TRK/SS2 capacitor at C47. The turn-on of one rail will not affect the other for the original demo board.

This board can be modified on the bench to allow VOUT1 to track an external signal. It can also be modified to allow VOUT2 to track VOUT1 or to allow VOUT2 to track an external signal. Tables 2 and 3 cover the rail tracking options for each rail, with the DC3850B-B version used as an example.

**Table 1. VOUT1 Tracking Options for a 1.5V Output**

| CONFIGURATION                                | TRACK 1 DIVIDER |                | TRK/SS1 CAPACITOR |
|----------------------------------------------|-----------------|----------------|-------------------|
|                                              | R3              | R2             | C2                |
| Soft-Start without Tracking (Original Board) | 0 $\Omega$      | Not Stuffed    | 0.1 $\mu$ F       |
| External Coincident Tracking                 | 17.8k $\Omega$  | 20.0k $\Omega$ | Not Stuffed       |

**Table 2. VOUT2 Tracking Options for a 1.2V Output**

| CONFIGURATION                                | TRACK 2 DIVIDER |                |                | TRK/SS2 CAPACITOR |
|----------------------------------------------|-----------------|----------------|----------------|-------------------|
|                                              | R36             | R34            | R37            | C47               |
| Soft-Start without Tracking (Original Board) | 0 $\Omega$      | Not Stuffed    | Not Stuffed    | 0.1 $\mu$ F       |
| Coincident Tracking to VOUT1 (1.5V)          | 0 $\Omega$      | 10.0k $\Omega$ | 20.0k $\Omega$ | Not Stuffed       |
| External Coincident Tracking                 | 10.0k $\Omega$  | Not Stuffed    | 20.0k $\Omega$ | Not Stuffed       |

### INDUCTOR DCR SENSING

Demonstration circuit 1185 provides an optional circuit for DCR sensing. DCR sensing uses the DCR of the inductor to sense the inductor current instead of discrete sense resistors. The advantages of DCR sensing are lower cost, reduced board space and higher efficiency, but the disadvantage is a less accurate current limit. If DCR sensing is used, be sure to select an inductor current with a sufficiently high saturation current or use an iron powder type. Tables 3 and 4 show an example of how to modify the DC1185 for DCR sensing using these parameters:

$$V_{OUT1} = 2.0V/10A$$

$$V_{OUT2} = 1.8V/10A$$

$$V_{IN} = 6.5V \text{ to } 14V$$

$$f_{SW} = 500kHz, \text{ typical}$$

$$L1, L2 = \text{Toko FDU0650-R56M=P3} \\ (0.56\mu H, DCR = 2.45m\Omega \text{ Typ, } 3.2m\Omega \text{ Max})$$

$$ILIM = \text{Floating (R42, R44 = Open)}$$

**Table 3.  $V_{OUT1}$  Configured as a 2.0V/10A Converter Using DCR Sensing and Discrete Sense Resistors**

| CONFIGURATION                                | RS1                                                       | L1                   | R <sub>SENSE</sub> FILTER RESISTORS | SENSE FILTER CAPACITOR | DCR FILTER/DIVIDER RESISTORS |                | SENSE1- TO L1- JUMPER |
|----------------------------------------------|-----------------------------------------------------------|----------------------|-------------------------------------|------------------------|------------------------------|----------------|-----------------------|
|                                              |                                                           |                      |                                     |                        | TOP                          | BOTTOM         |                       |
|                                              |                                                           |                      | R29, R30                            | C14                    | R45                          | R47            | R61                   |
| DCR Sensing                                  | Short with Cu Strip or Very Short and Thick Piece of Wire | Toko FDU0650-R56M=P3 | Open                                | 0.1 $\mu$ F            | 2.37k $\Omega$               | 6.49k $\Omega$ | 0 $\Omega$            |
| Discrete R <sub>SENSE</sub> (Original Board) | 3m $\Omega$ 2010 Package                                  | Toko FDU0650-R56M=P3 | 100 $\Omega$                        | 1nF                    | Open                         | Open           | Open                  |

**Table 4.  $V_{OUT2}$  Configured as a 1.8V/10A Converter Using DCR Sensing and Discrete Sense Resistors**

| CONFIGURATION                                | RS2                                                       | L2                   | R <sub>SENSE</sub> FILTER RESISTORS | SENSE FILTER CAPACITOR | DCR FILTER/DIVIDER RESISTORS |                | SENSE1- TO L1- JUMPER |
|----------------------------------------------|-----------------------------------------------------------|----------------------|-------------------------------------|------------------------|------------------------------|----------------|-----------------------|
|                                              |                                                           |                      |                                     |                        | TOP                          | BOTTOM         |                       |
|                                              |                                                           |                      | R39, R40                            | C15                    | R51                          | R53            | R62                   |
| DCR Sensing                                  | Short with Cu Strip or Very Short and Thick Piece of Wire | Toko FDU0650-R56M=P3 | Open                                | 0.1 $\mu$ F            | 2.37k $\Omega$               | 6.49k $\Omega$ | 0 $\Omega$            |
| Discrete R <sub>SENSE</sub> (Original Board) | 3m $\Omega$ 2010 Package                                  | Toko FDU0650-R56M=P3 | 100 $\Omega$                        | 1nF                    | Open                         | Open           | Open                  |

### SYNCHRONIZATION TO AN EXTERNAL CLOCK

The LTC3850 uses a phase-lock-loop which forces its internal clock to be synchronized to an external clock. Once synchronized, the rising edge of the top FET gate is aligned to the rising edge of the external clock. The external clock signal needs to be applied to the LTC3850's MODE pin which is tied to the turret labeled SYNC. The internal phase lock loop is stabilized by a network on the FREQ pin of the LTC3850. To set up the DC1185 for synchronization to an external clock, follow the steps below.

1. Remove R7.
2. Stuff 10k $\Omega$  at R8.
3. Stuff 10nF at R10.
4. Leave 1nF at C12.
5. Float the MODE pin by placing the MODE jumper in the BM position.
6. Apply the external clock from the turret la-beled SYNC to GND.

### PARTS LIST (DC1185B-A)

| ITEM                                 | QTY | REFERENCE                                                                        | PART DESCRIPTION                      | MANUFACTURER/PART NUMBER         |
|--------------------------------------|-----|----------------------------------------------------------------------------------|---------------------------------------|----------------------------------|
| <b>Required Circuit Components</b>   |     |                                                                                  |                                       |                                  |
| 1                                    | 3   | C11, C32, C36                                                                    | CAP, 0805 4.7 $\mu$ F 10% 6.3V X5R    | AVX 08056D475KAT                 |
| 2                                    | 5   | C12, C14, C15, C41, C44                                                          | CAP, 0603 1nF 10% 50V X7R             | AVX 06035C102KAT                 |
| 3                                    | 5   | C2, C17, C20, C21, C47                                                           | CAP, 0603 0.1 $\mu$ F 10% 25V X7R     | TDK C1608X7R1E104K               |
| 4                                    | 2   | C43, C42                                                                         | CAP, 0603 100pF 5% 25V X7R            | AVX 06033C101JAT                 |
| 5                                    | 1   | CIN1                                                                             | CAP, 180 $\mu$ F 20% 16V OSCON        | SANYO OSCON 16SVP180MX           |
| 6                                    | 2   | CIN2, CIN3                                                                       | CAP, 1210 10 $\mu$ F 10% 16V X5R      | TAIYO YUDEN EMK325BJ106KN-T      |
| 7                                    | 2   | COUT1, COUT4                                                                     | CAP, 1210 47 $\mu$ F 20% 6.3V X5R     | TDK C3225X5R0J476MT              |
| 8                                    | 4   | COUT2, COUT3, COUT5, COUT6                                                       | CAP, 7343 330 $\mu$ F 20% 2.5V POSCAP | SANYO 2R5TPE330M9                |
| 9                                    | 2   | D2, D1                                                                           | DIODE, CMDSH-3 SOD323                 | CENTRAL CMDSH-3TR                |
| 10                                   | 2   | L1, L2                                                                           | IND, 0.56 $\mu$ H                     | TOKO FDU0650-R56M=P3             |
| 11                                   | 2   | Q1, Q3                                                                           | XSTR, N-CHANNEL MOSFET                | RENESAS RJK0305DPB               |
| 12                                   | 2   | Q2, Q4                                                                           | XSTR, N-CHANNEL MOSFET                | RENESAS RJK0330DPB               |
| 13                                   | 1   | R10                                                                              | RES, 0603 3.16k 1% 1/10W              | VISHAY CRCW06033K16FKEA          |
| 14                                   | 1   | R18                                                                              | RES, 0603 2.2 $\Omega$ 5% 1/10W       | VISHAY CRCW06032R20JNEA          |
| 15                                   | 1   | R27                                                                              | RES, 0603 30.1k 1% 1/10W              | VISHAY CRCW060330K1FKEA          |
| 16                                   | 4   | R29, R30, R39, R40                                                               | RES, 0603 100 $\Omega$ 5% 1/10W       | VISHAY CRCW0603100RJNEA          |
| 17                                   | 2   | R31, R35                                                                         | RES, 0603 8.66k 1% 1/10W              | VISHAY CRCW06038K66FKEA          |
| 18                                   | 2   | R32, R33                                                                         | RES, 0603 20k 1% 1/10W                | VISHAY CRCW060320KFKEA           |
| 19                                   | 1   | R43                                                                              | RES, 0603 25.5k 1% 1/10W              | VISHAY CRCW060325K5FKEA          |
| 20                                   | 1   | R46                                                                              | RES, 0603 100k 5% 1/10W               | VISHAY CRCW0603100KJNEB          |
| 21                                   | 2   | R7, R4                                                                           | RES, 0603 10k 1% 1/16W                | VISHAY CRCW060310K0FKEB          |
| 22                                   | 3   | R8, R9, R25                                                                      | RES, 0603 0 $\Omega$ JUMPER           | PANASONIC ERJ3GEY0R00V           |
| 23                                   | 2   | RS2, RS1                                                                         | RES, 2010 0.003 $\Omega$ 5% 1/2W      | VISHAY WSL20103L000FEA           |
| 24                                   | 1   | U1                                                                               | IC, LTC3850EUF                        | LINEAR TECH. LTC3850EUF          |
| <b>Additional Circuit Components</b> |     |                                                                                  |                                       |                                  |
| 1                                    | 0   | CIN5, CIN4                                                                       | CAP, 1210 OPTION                      | OPTION                           |
| 2                                    | 0   | C1, C37, C38, C47, C48, C49                                                      | CAP, 0603 OPTION                      | OPTION                           |
| 3                                    | 1   | C50                                                                              | CAP, 0603 1 $\mu$ F 20% 16V X7R       | AVX 0603YC105MAT2A               |
| 4                                    | 0   | D4, D3                                                                           | DIODE, SCHOTTKY 40V 3A OPTION         | OPTION                           |
| 5                                    | 0   | Q5, Q6, Q7, Q8                                                                   | DO NOT STUFF                          | OPTION                           |
| 6                                    | 3   | R1, R3, R36                                                                      | RES, 0603 0 $\Omega$ JUMPER           | PANASONIC ERJ3GEY0R00V           |
| 7                                    | 0   | R2, R26, R28, R34, R37, R38, R41, R42, R44, R45, R47, R49, R50-R53, R55, R60-R62 | RES, 0603 OPTION                      | OPTION                           |
| <b>Hardware</b>                      |     |                                                                                  |                                       |                                  |
| 1                                    | 12  | E1-E6, E9-E14                                                                    | TURRET                                | MILL-MAX 2501-2-00-80-00-00-07-0 |
| 2                                    | 2   | JP2, JP1                                                                         | HEADER, 3-PIN, 2mm                    | SAMTEC TMM-103-02-L-S            |
| 3                                    | 1   | JP3                                                                              | HEADER, 4-PIN                         | SAMTEC TMM-104-02-L-S            |
| 4                                    | 6   | J1, J2, J3, J4, J5, J6                                                           | JACK, BANANA                          | KEYSTONE 575-4                   |
| 5                                    | 3   | JP1-JP3                                                                          | SHUNT, 2mm                            | SAMTEC 2SN-BK-G                  |

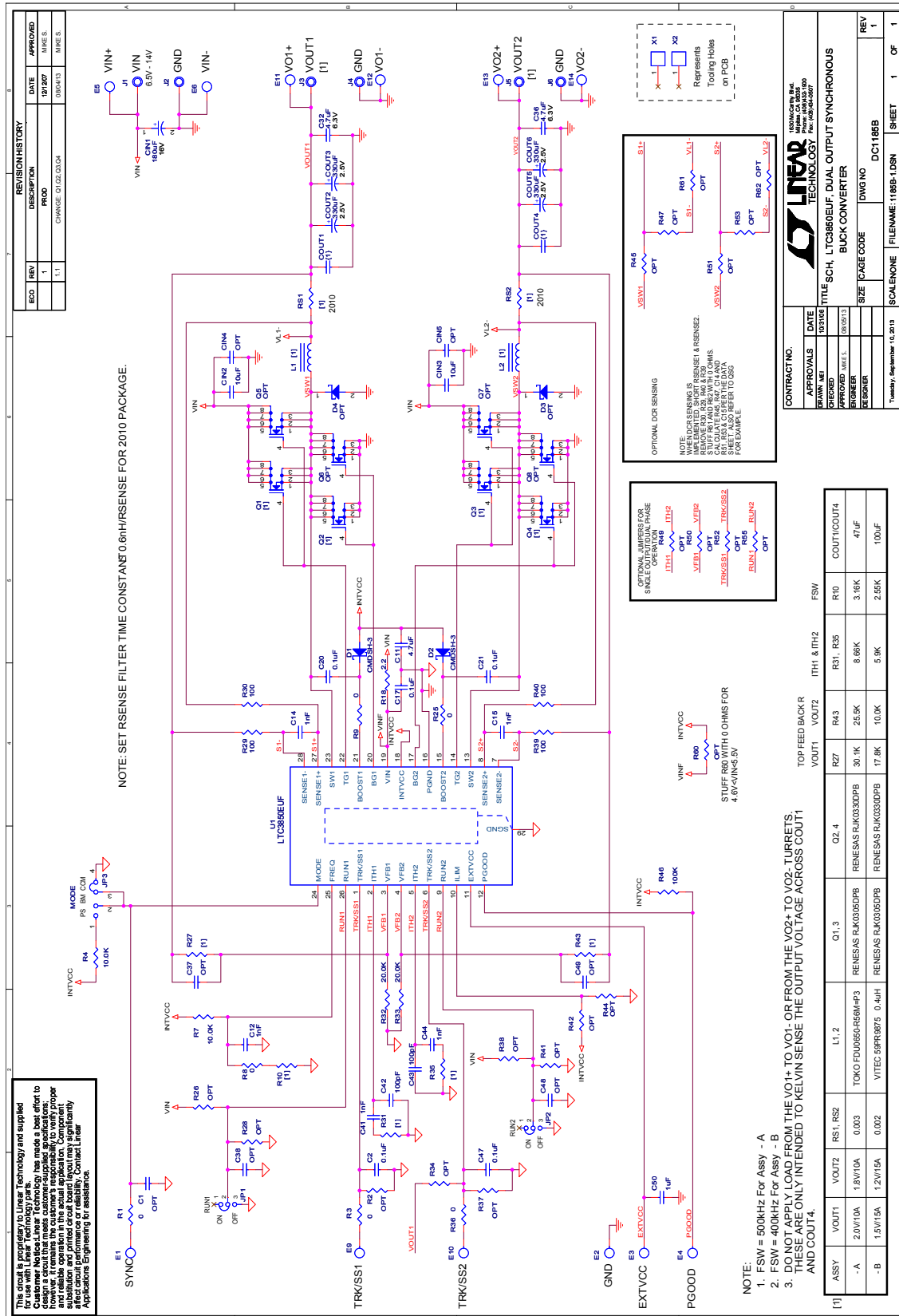
# DEMO MANUAL

## DC1185B-A/-B

### PARTS LIST (DC1185B-B)

| ITEM                                 | QTY | REFERENCE                                                                        | PART DESCRIPTION                | MANUFACTURER/PART NUMBER         |
|--------------------------------------|-----|----------------------------------------------------------------------------------|---------------------------------|----------------------------------|
| <b>Required Circuit Components</b>   |     |                                                                                  |                                 |                                  |
| 1                                    | 3   | C11, C32, C36                                                                    | CAP, 0805 4.7µF 10% 6.3V X5R    | AVX 08056D475KAT                 |
| 2                                    | 5   | C12, C14, C15, C41, C44                                                          | CAP, 0603 1nF 10% 50V X7R       | AVX 06035C102KAT                 |
| 3                                    | 5   | C2, C17, C20, C21, C47                                                           | CAP, 0603 0.1µF 10% 25V X7R     | TDK C1608X7R1E104K               |
| 4                                    | 2   | C43, C42                                                                         | CAP, 0603 100pF 5% 25V X7R      | AVX 06033C101JAT                 |
| 5                                    | 1   | CIN1                                                                             | CAP, 180µF 20% 16V OSCON        | SANYO OSCON 16SVP180MX           |
| 6                                    | 2   | CIN2, CIN3                                                                       | CAP, 1210 10µF 10% 16V X5R      | TAIYO YUDEN EMK325BJ106KN-T      |
| 7                                    | 2   | COUT1, COUT4                                                                     | CAP, 1210 100µF 20% 6.3V X5R    | TDK C3225X5R0J107MT              |
| 8                                    | 4   | COUT2, COUT3, COUT5, COUT6                                                       | CAP, 7343 330µF 20% 2.5V POSCAP | SANYO 2R5TPE330M9                |
| 9                                    | 2   | D2, D1                                                                           | DIODE, CMDSH-3 SOD323           | CENTRAL CMDSH-3TR                |
| 10                                   | 2   | L1, L2                                                                           | IND, 0.4µH                      | VITEC 59PR9875                   |
| 11                                   | 2   | Q1, Q3                                                                           | XSTR, N-CHANNEL MOSFET          | RENESAS RJK0305DPB               |
| 12                                   | 2   | Q2, Q4                                                                           | XSTR, N-CHANNEL MOSFET          | RENESAS RJK0330DPB               |
| 13                                   | 1   | R10                                                                              | RES, 0603 2.55k 1% 1/10W        | VISHAY CRCW06032K55FKEB          |
| 14                                   | 1   | R18                                                                              | RES, 0603 2.2Ω 5% 1/10W         | VISHAY CRCW06032R20JNEA          |
| 15                                   | 1   | R27                                                                              | RES, 0603 17.8k 1% 1/10W        | VISHAY CRCW060317K8FKEA          |
| 16                                   | 4   | R29, R30, R39, R40                                                               | RES, 0603 100Ω 5% 1/10W         | VISHAY CRCW0603100RJNEA          |
| 17                                   | 2   | R31, R35                                                                         | RES, 0603 5.9k 1% 1/10W         | VISHAY CRCW06035K90FKEA          |
| 18                                   | 2   | R32, R33                                                                         | RES, 0603 20k 1% 1/10W          | VISHAY CRCW060320KFKEA           |
| 19                                   | 1   | R43                                                                              | RES, 0603 10.0k 1% 1/10W        | VISHAY CRCW060310K0FKEB          |
| 20                                   | 1   | R46                                                                              | RES, 0603 100k 5% 1/10W         | VISHAY CRCW0603100KJNEB          |
| 21                                   | 2   | R7, R4                                                                           | RES, 0603 10k 1% 1/16W          | VISHAY CRCW060310K0FKEB          |
| 22                                   | 3   | R8, R9, R25                                                                      | RES, 0603 0Ω JUMPER             | PANASONIC ERJ3GEY0R00V           |
| 23                                   | 2   | RS2, RS1                                                                         | RES, 2010 0.002Ω 5% 1/2W        | VISHAY WSL20102L000FEA           |
| 24                                   | 1   | U1                                                                               | IC, LTC3850EUF                  | LINEAR TECH. LTC3850EUF          |
| <b>Additional Circuit Components</b> |     |                                                                                  |                                 |                                  |
| 1                                    | 0   | CIN5, CIN4                                                                       | CAP, 1210 OPTION                | OPTION                           |
| 2                                    | 0   | C1, C37, C38, C47, C48, C49                                                      | CAP, 0603 OPTION                | OPTION                           |
| 3                                    | 1   | C50                                                                              | CAP, 0603 1µF 20% 16V X7R       | AVX 0603YC105MAT2A               |
| 4                                    | 0   | D4, D3                                                                           | DIODE, SCHOTTKY 40V 3A OPTION   | OPTION                           |
| 5                                    | 0   | Q5, Q6, Q7, Q8                                                                   | DO NOT STUFF                    | OPTION                           |
| 6                                    | 3   | R1, R3, R36                                                                      | RES, 0603 0Ω JUMPER             | PANASONIC ERJ3GEY0R00V           |
| 7                                    | 0   | R2, R26, R28, R34, R37, R38, R41, R42, R44, R45, R47, R49, R50-R53, R55, R60-R62 | RES, 0603 OPTION                | OPTION                           |
| <b>Hardware</b>                      |     |                                                                                  |                                 |                                  |
| 1                                    | 12  | E1-E6, E9-E14                                                                    | TURRET                          | MILL-MAX 2501-2-00-80-00-00-07-0 |
| 2                                    | 2   | JP2, JP1                                                                         | HEADER, 3-PIN, 2mm              | SAMTEC TMM-103-02-L-S            |
| 3                                    | 1   | JP3                                                                              | HEADER, 4-PIN                   | SAMTEC TMM-104-02-L-S            |
| 4                                    | 6   | J1, J2, J3, J4, J5, J6                                                           | JACK, BANANA                    | KEYSTONE 575-4                   |
| 5                                    | 3   | JP1-JP3                                                                          | SHUNT, 2mm                      | SAMTEC 2SN-BK-G                  |

## SCHEMATIC DIAGRAM



# DEMO MANUAL

## DC1185B-A/-B

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### DEMONSTRATION BOARD IMPORTANT NOTICE

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Mailing Address:

Linear Technology  
1630 McCarthy Blvd.  
Milpitas, CA 95035

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**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331