

# LTC3553EPD: Micropower USB Power Manager with Li-Ion Charger, Buck DC/DC, and LDO Regulator

## DESCRIPTION

Demonstration Circuit DC1550A is a Micropower USB Power Manager with Li-Ion Charger, Buck DC/DC, and LDO Regulator featuring the LTC<sup>®</sup>3553.

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

| SYMBOL | PARAMETER                     | CONDITIONS                                      | MIN  | TYP | MAX  | UNITS |
|--------|-------------------------------|-------------------------------------------------|------|-----|------|-------|
| VBUS   | Bus Input Voltage Range       |                                                 | 4.35 |     | 6    | V     |
| V(BAT) | Battery Float Voltage         | Constant Voltage Mode                           | 4.15 |     | 4.23 | V     |
| I(BAT) | Battery Charge Current        | Constant Current Mode, R <sub>PRG</sub> = 1.87k | 420  |     | 500  | mA    |
| VLDO   | LDO Output Voltage            | I(VLDO) ≤ 200mA                                 | 3.25 |     | 3.35 | V     |
| VBUCK  | Buck Regulator Output Voltage | I(VBUCK) ≤ 200mA                                | 1.15 |     | 1.25 | V     |

## QUICK START PROCEDURE

Refer to Figure 1 for the proper measurement equipment setup and jumper settings and follow the procedure below.

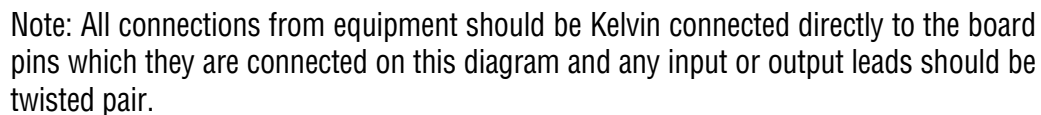
**NOTE.** When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the VBUS or VOUT(x) and GND terminals. See Figure 2 for proper scope probe technique.

1. Set PS1 = 0V, PS2 = 3.6V. Press “ON” button for > 0.5s. Observe I(BAT) (AM2), VBUCK (VM5) and VLDO (VM6).  
The LTC3553 is in STBY which reduces the battery current to less than 15μA, even with both regulators running. In STBY the maximum current from regulators is reduced to as low as 10mA
2. Set STBY (JP6) to “OFF”, PS1 to 5V. Observe I(VBUS) (AM1), I(BAT) (AM2) and VPROG (VM2).

The LTC3553 is now operating in normal mode drawing more current from the battery. However the regulators are now capable of delivering over 200mA each. Also, since VBUS is now available, the battery charger is operating, but charge current is limited by the input current limit to 100mA.

3. Set HPWR (JP2) to “500mA”. Observe I(VBUS) (AM1), I(BAT) (AM2) and VPROG (VM2).  
The input current limit is now 500mA, so the battery charger is delivering ~420mA to the battery.
4. Set LD2 to 200mA, LD3 to 200mA. Observe VBUCK (VM5), VLDO (VM6) and I(BAT) (AM2).  
Each regulator is supplying 200mA, and since the efficiency is ~90%, drawing ~225mA. So, the battery charger is only delivering approximately 50mA. This is because the input current limit is 500mA – 225mA – 225mA = 50mA.

5. Set LD2 to 0A, LD3 to 0A. Press “OFF” button.  
Observe VBUCK (VM5) and VLDO (VM6).  
The regulators are now off and therefore supplying 0 current. The battery charger is once again supplying ~ 420mA to the battery.
6. Reset the Jumpers to their default position.



Note: All connections from equipment should be Kelvin connected directly to the board pins which they are connected on this diagram and any input or output leads should be twisted pair.

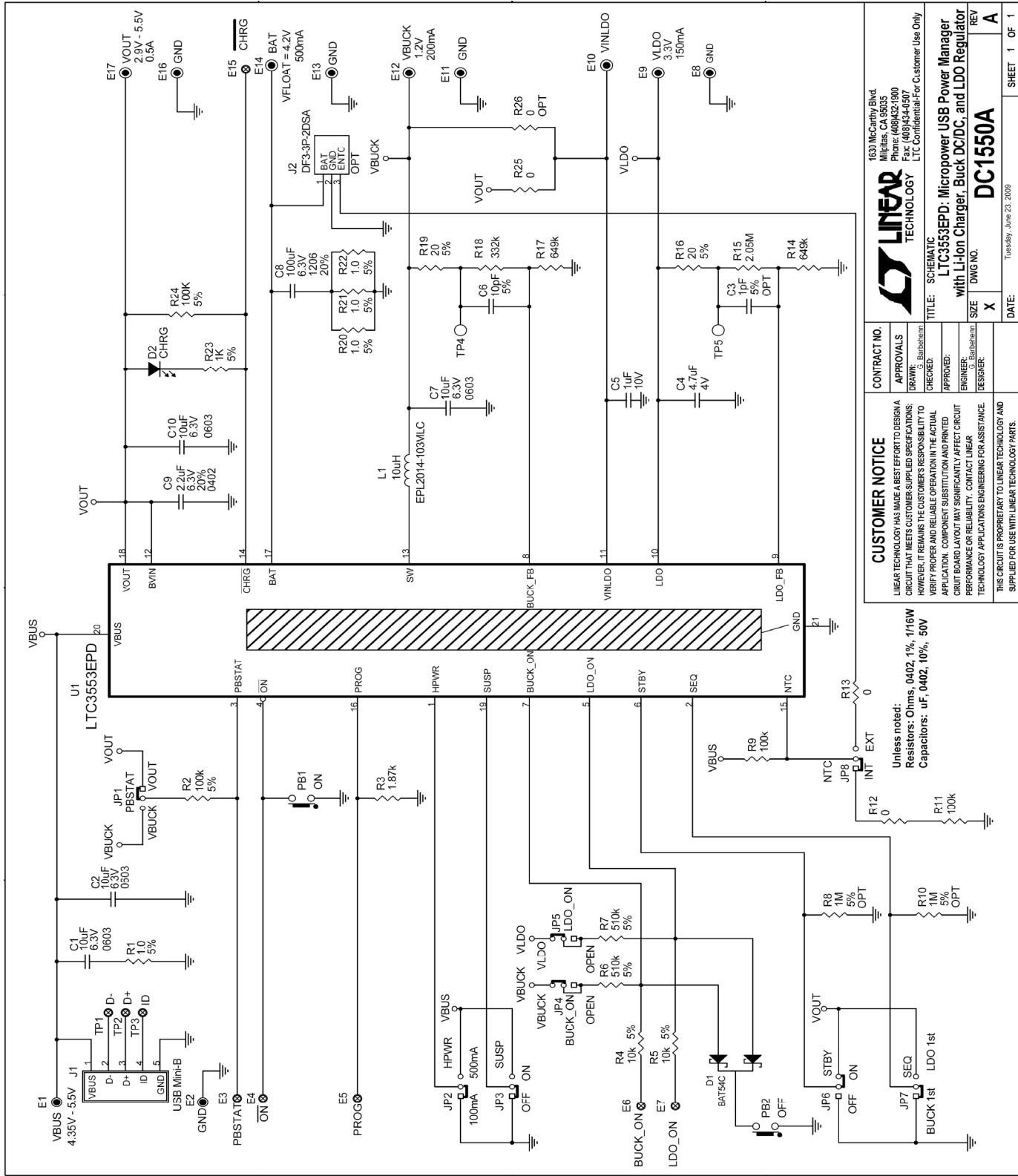


Figure 3. Circuit Schematic

|                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                                                                                                                                                |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>CUSTOMER NOTICE</b><br>LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE. |  | <b>CONTRACT NO.</b><br><b>APPROVALS</b><br>DRAWN: (S. Balasubramanian)<br>CHECKED:<br>APPROVED:<br>ENGINEER: (S. Balasubramanian)<br>DESIGNER: |  |
| <b>LINEAR TECHNOLOGY</b><br>1633 McCarthy Blvd.<br>Milpitas, CA 95035<br>Phone: (408)432-1900<br>Fax: (408)434-0507<br>LTC Confidential-For Customer Use Only                                                                                                                                                                                                                                                                                    |  | <b>TITLE:</b> SCHEMATIC<br><b>LTC3553EPD: Micropower USB Power Manager with Li-Ion Charger, Buck DC/DC, and LDO Regulator</b>                  |  |
| <b>SIZE</b> X                                                                                                                                                                                                                                                                                                                                                                                                                                    |  | <b>DWG NO.</b> DC1550A                                                                                                                         |  |
| <b>DATE:</b> Tuesday, June 23, 2009                                                                                                                                                                                                                                                                                                                                                                                                              |  | <b>REV</b> A                                                                                                                                   |  |
| <b>SHEET</b> 1                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | <b>OF</b> 1                                                                                                                                    |  |

|                                                  | Qty | Reference                                         | Part Description                                                                | Manufacture / Part #       |
|--------------------------------------------------|-----|---------------------------------------------------|---------------------------------------------------------------------------------|----------------------------|
| <b>REQUIRED CIRCUIT COMPONENTS:</b>              |     |                                                   |                                                                                 |                            |
| 1                                                | 3   | C2, C7, C10                                       | CAP, CHIP, X5R, 10 $\mu$ F, $\pm$ 10%, 6.3V, 0603                               | TDK, C1608X5R0J106K        |
| 2                                                | 1   | C4                                                | CAP, CHIP, X5R, 4.7 $\mu$ F, $\pm$ 20%, 4V, 0402                                | MURATA, GRM155R60G475M     |
| 3                                                | 1   | C5                                                | CAP, CHIP, X5R, 1 $\mu$ F, $\pm$ 10%, 10V, 0402                                 | MURATA, GRM155R61A105KE15D |
| 4                                                | 1   | C6                                                | CAP, CHIP, C0G, 10pF, $\pm$ 5%, 50V, 0402                                       | MURATA, GRM1555C1H100JZ01D |
| 5                                                | 1   | C9                                                | CAP, CHIP, X5R, 2.2 $\mu$ F, $\pm$ 20%, 6.3V, 0402                              | MURATA, GRM155R60J225ME15D |
| 6                                                | 1   | L1                                                | IND, SMT, 10 $\mu$ H, 459m $\Omega$ , $\pm$ 20%, 0.631A, 2mmX2mm                | COILCRAFT, EPL2014-103MLC  |
| 7                                                | 1   | R3                                                | RES, CHIP, 1.87k $\Omega$ , $\pm$ 1%, 1/16W, 0402                               | VISHAY, CRCW04021K87FKED   |
| 8                                                | 2   | R9, R11                                           | RES, CHIP, 100k $\Omega$ , $\pm$ 1%, 1/16W, 0402                                | VISHAY, CRCW0402100KFKED   |
| 9                                                | 3   | R12, R13, R25, R26-OPT                            | RES, CHIP, 0 $\Omega$ jumper, 1/16W, 0402                                       | VISHAY, CRCW04020000Z0ED   |
| 10                                               | 2   | R14, R17                                          | RES, CHIP, 649k $\Omega$ , $\pm$ 1%, 1/16W, 0402                                | VISHAY, CRCW0402649KFKED   |
| 11                                               | 1   | R15                                               | RES, CHIP, 2.05MEG $\Omega$ , $\pm$ 1%, 1/16W, 0402                             | VISHAY, CRCW04022M05FKED   |
| 12                                               | 1   | R18                                               | RES, CHIP, 332k $\Omega$ , $\pm$ 1%, 1/16W, 0402                                | VISHAY, CRCW0402332KFKED   |
| 13                                               | 1   | U1                                                | Micropower USB Power Manager with Li-Ion Charger, Buck DC/DC, and LDO Regulator | LINEAR TECH., LTC3553EPD   |
| <b>ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:</b> |     |                                                   |                                                                                 |                            |
| 1                                                | 1   | C1                                                | CAP, CHIP, X5R, 10 $\mu$ F, $\pm$ 10%, 6.3V, 0603                               | TDK, C1608X5R0J106K        |
| 2                                                | 0   | C3-OPT                                            | CAP, CHIP, C0G, 1pF, $\pm$ 5%, 50V, 0402                                        | VISHAY, VJ0402A1R0JXAA     |
| 3                                                | 1   | C8                                                | CAP, CHIP, X5R, 100 $\mu$ F, $\pm$ 20%, 6.3V, 1206                              | MURATA, GRM31CR60J107ME39L |
| 4                                                | 1   | D1                                                | DIODE, Dual Schottky, 30V, 200mA, SOT23                                         | DIODES INC., BAT54C        |
| 5                                                | 1   | D2                                                | LED, GREEN, 0603                                                                | LITE-ON, LTST-C190KGKT     |
| 6                                                | 4   | R1, R20, R21, R22                                 | RES, CHIP, 1 $\Omega$ , $\pm$ 5%, 1/16W, 0402                                   | VISHAY, CRCW04021R00JNED   |
| 7                                                | 2   | R2, R24                                           | RES, CHIP, 100k $\Omega$ , $\pm$ 5%, 1/16W, 0402                                | VISHAY, CRCW0402100KJNED   |
| 8                                                | 2   | R4, R5                                            | RES, CHIP, 10k $\Omega$ , $\pm$ 5%, 1/16W, 0402                                 | VISHAY, CRCW040210K0JNED   |
| 9                                                | 2   | R6, R7                                            | RES, CHIP, 510k $\Omega$ , $\pm$ 5%, 1/16W, 0402                                | VISHAY, CRCW0402510KJNED   |
| 10                                               | 0   | R8-OPT, R10-OPT                                   | RES, CHIP, 1MEG $\Omega$ , $\pm$ 5%, 1/16W, 0402                                | VISHAY, CRCW04021M00JNED   |
| 11                                               | 2   | R16, R19                                          | RES, CHIP, 20 $\Omega$ , $\pm$ 5%, 1/16W, 0402                                  | VISHAY, CRCW040220R0JNED   |
| 12                                               | 1   | R23                                               | RES, CHIP, 1k $\Omega$ , $\pm$ 5%, 1/10W, 0603                                  | VISHAY, CRCW06031K00JNED   |
| <b>HARDWARE FOR DEMO BOARD ONLY:</b>             |     |                                                   |                                                                                 |                            |
| 1                                                | 11  | E1, E2, E8, E9, E10, E11, E12, E13, E14, E16, E17 | TURRET, 0.09"                                                                   | MILLMAX, 2501-2            |
| 2                                                | 6   | E3, E4, E5, E6, E7, E15                           | TURRET, 0.061"                                                                  | MILLMAX, 2308-2            |
| 3                                                | 1   | J1                                                | CONN, USB Mini-B                                                                | TYCO, 1734035-2            |
| 4                                                | 0   | J2-OPT                                            | CONN, 3 Pin Polarized                                                           | HIROSE, DF3-3P-2DSA        |
| 5                                                | 8   | JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8            | HEADER, 3 Pin, 2mm                                                              | SAMTEC, TMM-103-02-L-S     |
| 6                                                | 8   | JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8            | SHUNT, 2mm                                                                      | SAMTEC, 2SN-BK-G           |
| 7                                                | 2   | PB1, PB2                                          | SWITCH, N.O. Momentary, 3.5mmx6mm SMT                                           | PANASONIC, EVQPPFA25       |
| 8                                                | 4   |                                                   | STAND-OFF, NYLON, 0.375"                                                        | KEYSTONE, 8832             |
| 9                                                | 1   |                                                   | FAB, PRINTED CIRCUIT BOARD                                                      | DEMO CIRCUIT 1550A         |
| 10                                               | 1   |                                                   | STENCIL-TOP                                                                     | STENCIL #1550-1-TOP        |
| 11                                               | 1   |                                                   | STENCIL-BOTTOM                                                                  | STENCIL #1550-1-BOTTOM     |

Figure 4. Bill of Materials

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9