

## LT3505EDD: PMIC High Voltage Adaptor Board with 5 Volt Adaptor Inputs

### DESCRIPTION

Demonstration Circuit 1395A is a 1.2A, Step-Down Switching Regulator in a 3mm × 3mm DFN. The LT3505EDD is available in an 8-pin (3mm × 3mm) DFN surface mount package.

LT, LTC, LTM, LT, Burst Mode, OPTI-LOOP, Over-The-Top and PolyPhase are registered trademarks of Linear Technology Corporation. Adaptive Power, C-Load, DirectSense, Easy Drive, FilterCAD, Hot Swap, LinearView, µModule, Micropower SwitcherCAD, Multimode Dimming, No Latency ΔΣ, No Latency Delta-Sigma, No R<sub>SENSE</sub>, Operational Filter, PanelProtect, PowerPath, PowerSOT, SmartStart, SoftSpan, Stage Shedding, SwitcherCAD, ThinSOT, UltraFast and VLDO are trademarks of Linear Technology Corporation. Other product names may be trademarks of the companies that manufacture the products.

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

| SYMBOL              | PARAMETER                        | CONDITIONS                       | MIN | TYP | MAX | UNITS |
|---------------------|----------------------------------|----------------------------------|-----|-----|-----|-------|
| HVIN                | High Voltage Input Voltage Range | Input disabled from 36-40V       | 8   |     | 40  | V     |
| 5V ADAPTOR          | 5V Adaptor Input Voltage Range   |                                  | 4.5 |     | 5.5 | V     |
| HVBUCK              | Output Voltage Range             | Range is mode and load dependant | 3.5 |     | 5.5 | V     |
| I <sub>HVBUCK</sub> | Output Current                   |                                  |     |     | 2   | A     |

### QUICK START PROCEDURE

Using short twisted pair leads for any power connections, with all loads and power supplies off, refer to Figures 1 & 2 for the proper measurement and equipment setup.

A companion PMIC demo board is required for this check out procedure. The DC1303A (LTC4098EPDC) board is recommended, and will be used for the following procedure. Please refer to the DC1303A Quick Start Guide for further information.

Follow the procedure below:

1. Set PS1 to 8V, PS2 to 0V, and PS3 to 3.6V. Set Load1 to 0A. Ensure that jumpers are configured as per Figure 1, except the “D2” jumper (JP3) on the DC1303A should be set to “1”.
2. Observe that 4.50V < V<sub>OUT</sub> (VM3) < 4.70V. The LT3480 HV Buck regulator is running with its control loop closed locally. The nominal HVBUCK voltage is 4.75V, and the

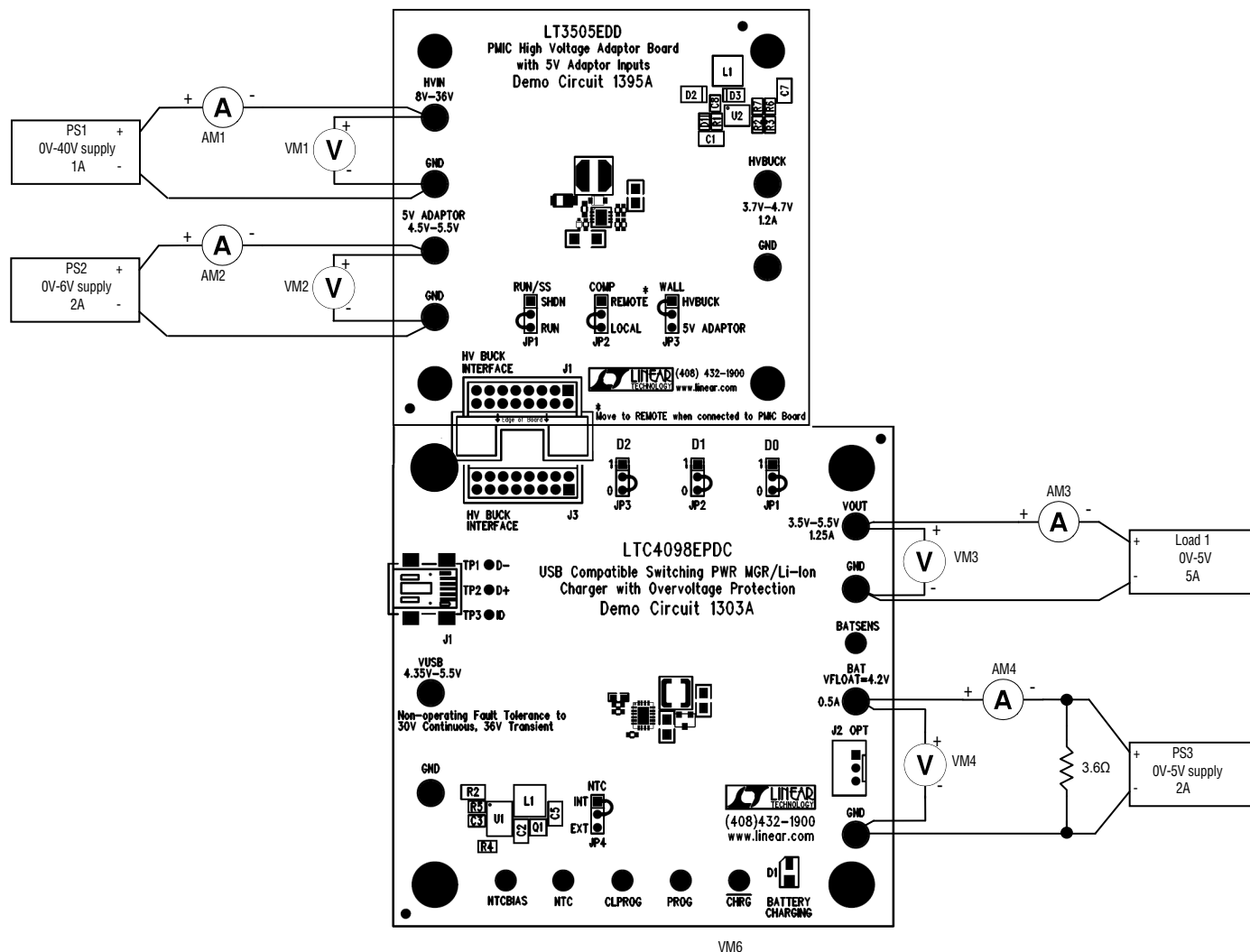
LTC4098EPDC on the DC1303A board has connected HVBUCK to V<sub>OUT</sub>.

3. Set Load1 to 1A. Observe that 4.35V < V<sub>OUT</sub> (VM3) 4.55V. Set Load1 to 0A. The 1A load on V<sub>OUT</sub> loads HVBUCK, so the LT3505EDD is supplying 1A.
4. Set PS1 to 36V. Observe that 4.50V < V<sub>OUT</sub> (VM3) < 4.70V. The LT3505 is designed to operate from HVIN = 8V to 36V.
5. Set Load1 to 1A. Observe that 4.20V < V<sub>OUT</sub> (VM3) < 4.55V. Set Load1 to 0A. The LT3505 is now supplying 1A, while operating from 38V.
6. Set “COMP” jumper (JP2) to “REMOTE”. Observe that 3.80V < V<sub>OUT</sub> (VM3) < 4.10V. The LTC4098EPDC is now controlling the LT3505 output voltage to approximately V(BAT) + 0.3V.
7. Set Load1 to 1A. Observe that 3.70V < V<sub>OUT</sub> (VM3) < 3.90V. Set Load1 to 0A. LT3505 is supplying 1A, while under LTC4098 control.
8. Set PS1 to 8V. Observe that 3.80V < V<sub>OUT</sub> (VM3) < 4.10V.

## LT3505EDD

---

9. Set Load1 to 1A. Observe that  $3.70V < (VM3) < 3.90V$ . Set Load1 to 0A.
10. Set PS2 to 4.5V, and “WALL” jumper (JP3) to “5V ADAPTOR”. Observe that  $4.40 < VOUT (VM3) < 4.50V$ . The LT3505 is not supplying power to VOUT. This verifies that the LTC4098 recognizes the 5V Adaptor input, and connects it to VOUT.
11. Set Load1 to 1A. Observe that  $4.10V < VOUT (VM3) < 4.40V$ . Set Load1 to 0A.
12. Set PS2 to 5.5V. Observe that  $5.40V < VOUT (VM3) < 5.50V$ .
13. Set Load1 to 1A. Observe that  $5.10V < VOUT (VM3) < 5.50V$ .



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

Figure 1. Proper Measurement Equipment Setup for DC1395A

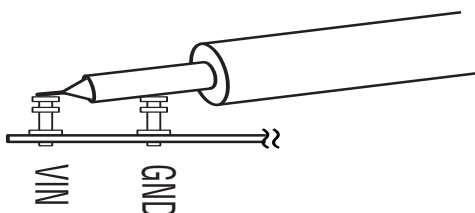
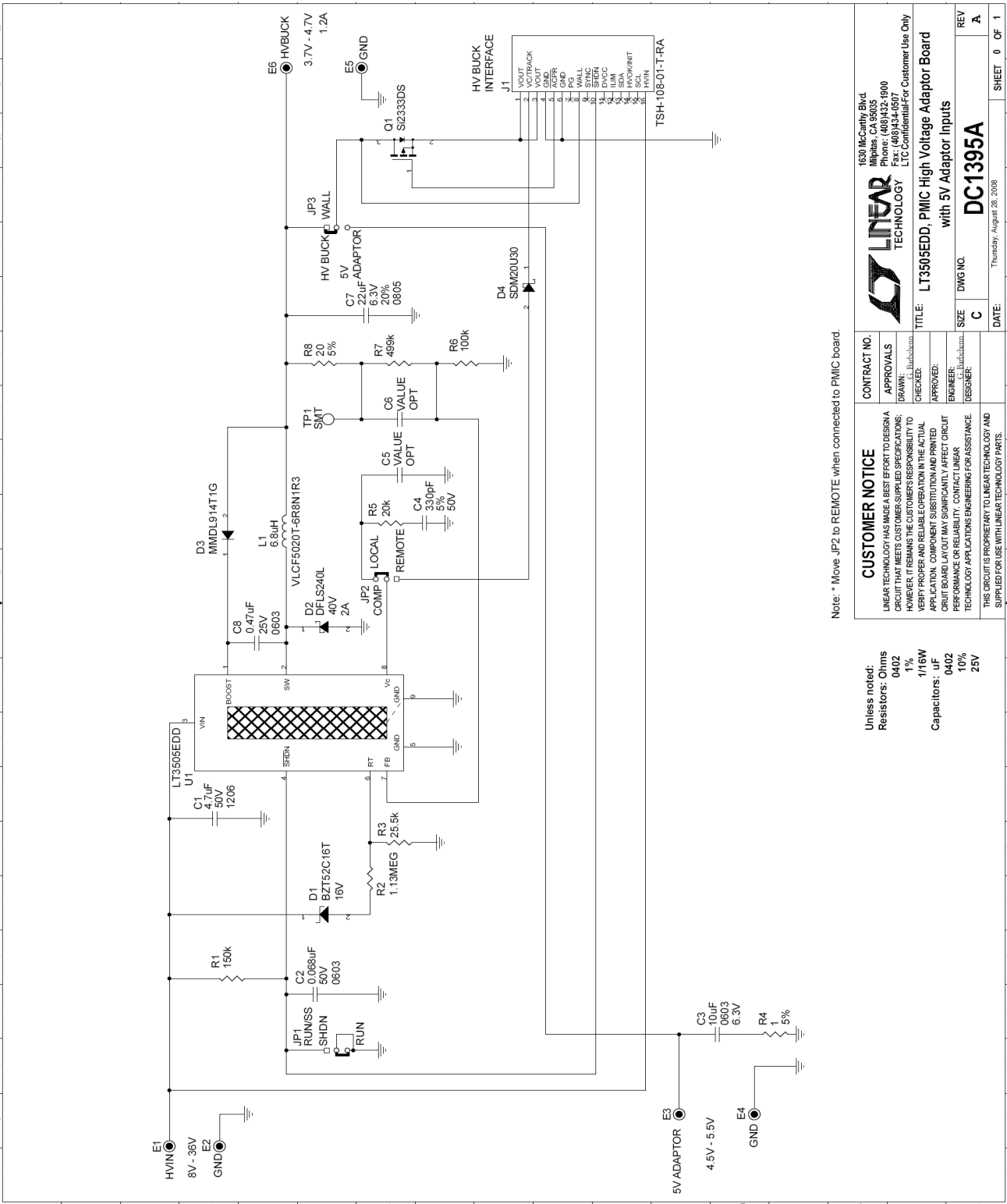


Figure 2. Measuring Input or Output Ripple



Note: \* Move JP2 to REMOTE when connected to PMIC board.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                                                                                                                                                               |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <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>APPROVALS<br>DRAWN: G. Hudakum<br>CHECKED: G. Hudakum<br>ENGINEER: G. Hudakum<br>DESIGNER: G. Hudakum                                  |              |
| Unless noted:<br>Resistors: Ohms<br>1%<br>1/16W<br>Capacitors: uF<br>0402<br>10%<br>25V                                                                                                                                                                                                                                                                                                                                                          |  | <b>LINEAR TECHNOLOGY</b><br>1630 McCarthy Blvd.<br>Milpitas, CA 95035<br>Phone: (408)432-1900<br>Fax: (408)434-0907<br>LTC Confidential For Customer Use Only |              |
| TITLE: LT3505EDD, PMIC High Voltage Adaptor Board<br>with 5V Adaptor Inputs                                                                                                                                                                                                                                                                                                                                                                      |  | SIZE: C                                                                                                                                                       | REV: A       |
| DATE: Thursday, August 28, 2008                                                                                                                                                                                                                                                                                                                                                                                                                  |  | DWG NO. DC1395A                                                                                                                                               | SHEET 0 OF 1 |

Figure 3. DC1395A Schematic

|                                                  | Qty | Reference         | Part Description                                                  | Manufacture / Part #         |
|--------------------------------------------------|-----|-------------------|-------------------------------------------------------------------|------------------------------|
| <b>REQUIRED CIRCUIT COMPONENTS:</b>              |     |                   |                                                                   |                              |
| 1                                                | 1   | C1                | CAP, CHIP, X7R, 4.7 $\mu$ F, $\pm$ 10%, 50V, 1206                 | MURATA, GRM31CR71H475KA12L   |
| 2                                                | 1   | C2                | CAP, CHIP, X7R, 0.068 $\mu$ F, $\pm$ 10%, 50V, 0603               | MURATA, GRM188R71H683K       |
| 3                                                | 1   | C4                | CAP, CHIP, BX, 330pF, 50V, 5%, 0402                               | VISHAY, VJ0402X331JXAA       |
| 4                                                | 1   | C7                | CAP, CHIP, X5R, 22 $\mu$ F, $\pm$ 20%, 6.3V, 0805                 | TAIYO-YUDEN, JMK212BJ226MG   |
| 5                                                | 1   | C8                | CAP, CHIP, X7R, 0.47 $\mu$ F, $\pm$ 10%, 25V, 0603                | MURATA, GRM188R71E474K       |
| 6                                                | 1   | D1                | DIODE, ZENER, 16V, $\pm$ 7%, 150mW, SOD-523                       | DIODES INC., BZT52C16T       |
| 7                                                | 1   | D2                | DIODE, SCHOTTKY, 2A, 40V, SMB                                     | DIODES INC., DFSL240L        |
| 8                                                | 1   | D3                | DIODE, SILICON, 200mA, 100V, SOD-323                              | ON SEMICONDUCTOR, MMDL914T1G |
| 9                                                | 1   | D4                | DIODE, SCHOTTKY, 200mA, 30V, SOD-523                              | DIODES INC., SDM20U30        |
| 10                                               | 1   | L1                | IND, SMT, 6.8 $\mu$ H, 0.122 $\Omega$ , $\pm$ 30%, 1.11A, 5mmX5mm | TDK, VLCF5020T-6R8N1R3       |
| 11                                               | 1   | Q1                | MOSFET, -12V, 35m $\Omega$ , -5.3A, SOT-23                        | VISHAY, Si2333DS             |
| 12                                               | 1   | R1                | RES, CHIP, 150k $\Omega$ , 1/16W, $\pm$ 1%, 0402                  | VISHAY, CRCW0402150KFKED     |
| 13                                               | 1   | R2                | RES, CHIP, 1.13M $\Omega$ , 1/16W, $\pm$ 1%, 0402                 | VISHAY, CRCW04021M13FKED     |
| 14                                               | 1   | R3                | RES, CHIP, 25.5k $\Omega$ , 1/16W, $\pm$ 1%, 0402                 | VISHAY, CRCW040225K5FKED     |
| 15                                               | 1   | R5                | RES, CHIP, 20k $\Omega$ , 1/16W, $\pm$ 1%, 0402                   | VISHAY, CRCW040220K0FKED     |
| 16                                               | 1   | R6                | RES, CHIP, 100k $\Omega$ , 1/16W, $\pm$ 1%, 0402                  | VISHAY, CRCW0402100KFKED     |
| 17                                               | 1   | R7                | RES, CHIP, 499k $\Omega$ , 1/16W, $\pm$ 1%, 0402                  | VISHAY, CRCW0402499KFKED     |
| 18                                               | 1   | U1                | LT3505EDD, PMIC High Voltage Adaptor Board with 5V Adaptor Inputs | LINEAR TECH., LT3505EDD      |
| <b>ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:</b> |     |                   |                                                                   |                              |
| 1                                                | 1   | C3                | CAP, CHIP, X5R, 10 $\mu$ F, $\pm$ 10%, 6.3V, 0603                 | TDK, C1608X5R0J106K          |
| 2                                                | 0   | C5-OPT, C6-OPT    | None                                                              | User determined              |
| 3                                                | 1   | R4                | RES, CHIP, 1.0 $\Omega$ , 1/16W, 5%, 0402                         | VISHAY, CRCW04021R00JNED     |
| 4                                                | 1   | R8                | RES, CHIP, 20 $\Omega$ , 1/16W, $\pm$ 5%, 0402                    | VISHAY, CRCW040220R0JNED     |
| <b>HARDWARE FOR DEMO BOARD ONLY:</b>             |     |                   |                                                                   |                              |
| 1                                                | 6   | E1,E2,E3,E4,E5,E6 | Turret, 0.09"                                                     | MILL-MAX, 2501-2             |
| 2                                                | 1   | J1                | CONN, HV interface                                                | SAMTEC, TSH-108-01-T-RA      |
| 3                                                | 3   | JP1,JP2,JP3       | 3 Pin Jumper, 2mm                                                 | SAMTEC, TMM-103-02-L-S       |
| 4                                                | 3   | JP1,JP2,JP3       | 2mm SHUNT                                                         | SAMTEC, 2SN-BK-G             |
| 5                                                | 4   |                   | STAND-OFF, NYLON 0.375" tall (SNAP ON)                            | KEYSTONE, 8832 (SNAP ON)     |

Figure 4. DC1395A BOM