Demonstration circuit 2106B-B is a high efficiency, high density, μModule regulator with 4.5V to 16V input range. The output voltage is adjustable from 0.5V to 1.8V, and it can supply 130A maximum load current. The demo board has 1×LTM4676A and 3×LTM4630 μModule regulators. The LTM4676A is a dual 13A or single 26A step-down regulator with PMBus power system management, and the LTM4630 is a dual 18A or single 36A step-down regulator. Please see LTM4676A and LTM4630 data sheets for more detailed information.

DC2106B-B powers up to default settings and produces power based on configuration resistors 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 part, 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, and view telemetry of voltage, current, temperature and fault status.

GUI Download
The software can be downloaded from:
http://www.linear.com/ltpowerplay

For more details and instructions of LTpowerPlay, please refer to LTpowerPlay GUI for LTM4676A Quick Start Guide.

Design files for this circuit board are available at http://www.linear.com/demo/DC2106B-B
DEMO MANUAL DC2106B-B

PERFORMANCE SUMMARY
Specifications are at $T_A = 25^\circ C$

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITION</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>Input Voltage Range</td>
<td>VIN = 4.5V to 16V</td>
<td>4.5V to 16V</td>
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<tr>
<td>Output Voltage, $V_{OUT0}$</td>
<td>$V_{IN} = 4.5V to 16V, I_{OUT0} = 0A to 130A</td>
<td>0.5V to 1.8V, Default: 1V</td>
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<tr>
<td>Maximum Output Current, $I_{OUT0}$</td>
<td>$V_{IN} = 4.5V to 16V, V_{OUT} = 0.5V to 1.8V</td>
<td>130A</td>
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<tr>
<td>Typical Efficiency</td>
<td>$V_{IN} = 12V, V_{OUT} = 1V, I_{OUT} = 130A</td>
<td>82.9%</td>
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<tr>
<td>Default Switching Frequency</td>
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<td>350kHz</td>
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QUICK START PROCEDURE

Demonstration circuit 2106B-B is easy to set up to evaluate the performance of the LTM4676AEY. Refer to Figure 2 for the proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to $V_{IN}$ (4.5V to 16V) and GND (input return).
2. Connect the output load between $V_{OUT0}$ and GND (Initial load: no load).
3. Connect the DVMs to the input and outputs. Set default switch position: SW1: ON; SW2: ON.
4. Turn on the input power supply and check for the proper output voltages. $V_{OUT0}$ should be 1V ±1%.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.
6. Connect the dongle and control the output voltages from the GUI. See “LTpowerPlay GUI for the LTM4676A Quick Start Guide” for details.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 3 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.

Connecting a PC to DC2106B-B

You can use a PC to reconfigure the power management features of the LTM4676A such as: nominal $V_{OUT}$, margin setpoints, OV/UV limits, temperature fault limits, sequencing parameters, the fault log, fault responses, GPIOs and other functionality. The DC1613A dongle may be plugged when $V_{IN}$ is present.

Table 1. LTM4676/LTM4676A Demo Cards for Up to 130A Point-of-Load Regulation

<table>
<thead>
<tr>
<th>MAXIMUM OUTPUT CURRENT</th>
<th>NUMBER OF OUTPUT VOLTAGES</th>
<th>NUMBER OF LTM4676/LTM4676A µMODULE REGULATORS ON THE BOARD</th>
<th>DEMO BOARD NUMBER</th>
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<td>13A, 13A</td>
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<td>1x LTM4676</td>
<td>DC1811A/DC1811B-A</td>
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<tr>
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<td>26A</td>
<td>1</td>
<td>1x LTM4676</td>
<td>DC2087A</td>
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<tr>
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<td>1</td>
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<td>DC1989A-A</td>
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<td>75A</td>
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<td>3x LTM4676</td>
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<td>DC1989A-C</td>
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<td>1x LTM4676 (+ 3x LTM4620A)</td>
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<tr>
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<td>1x LTM4676 (+ 3x LTM4630)</td>
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<tr>
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<td>1</td>
<td>1x LTM4676A (+ 3x LTM4620A)</td>
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<tr>
<td>130A</td>
<td>1</td>
<td>1x LTM4676A (+ 3x LTM4630)</td>
<td>DC2106B-B</td>
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</table>
QUICK START PROCEDURE

Figure 2. Proper Measurement Equipment Setup

Figure 3. Measuring Output Voltage Ripple
QUICK START PROCEDURE

Figure 4. Demo Setup with PC

Figure 5. Efficiency vs Load Current at VIN = 12V
**QUICK START PROCEDURE**

---

**Figure 6.** Output Voltage $V_{OUT0}$ vs Load Current ($V_{OUT0}$ RANGE = 0)

**Figure 7.** Output Voltage Ripple at $V_{IN} = 12V$, $V_{OUT0} = 1V$, $I_{OUT0} = 130A$

**Figure 8.** Thermal Performance at $V_{IN} = 12V$, $V_{OUT0} = 1V$, $I_{OUT0} = 130A$, $T_A = 23.3^\circ C$, Air Flow 300LFM

**Figure 9.** Current Sharing Performance at $V_{IN} = 12V$, $V_{OUT0} = 1V$
**DEMO MANUAL DC2106B-B**

**QUICK START PROCEDURE**

**LTpowerPlay Software GUI**

LTpowerPlay is a powerful Windows based development environment that supports Linear Technology power system management ICs, including the LTM4676A, LTC3880, LTC3883, LTC2974 and LTC2978. 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 LTM4676, the LTC3880 and the LTC3883’s 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://linear.com/ltpowerplay

To access technical support documents for LTC Digital Power Products visit Help. View online help on the LTpowerPlay menu.

**LTpowerPlay QUICK START PROCEDURE**

The following procedure describes how to use LTpowerPlay to monitor and change the settings of LTM4676A.

1. Download and install the LTpowerPlay GUI:

http://linear.com/ltpowerplay
QUICK START PROCEDURE

2. Launch the LTpowerPlay GUI.
   a. The GUI should automatically identify the DC2106B-B. The system tree on the left hand side should look like this:

   ![System Tree Screenshot]

   b. A green message box shows for a few seconds in the lower left hand corner, confirming that LTM4676A is communicating:

   ![Green Message Screenshot]

   c. In the Toolbar, click the “R” (RAM to PC) icon to read the RAM from the LTM4676A. This reads the configuration from the RAM of LTM4676A and loads it into the GUI.

   ![RAM to PC Icon Screenshot]

   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:

   ![VOUT_COMMAND Box Screenshot]

   Then, click the “W” (PC to RAM) icon to write these register values to the LTM4676A. After finishing this step, you will see the output voltage will change to 1.5V.

   ![Output Voltage Change Screenshot]

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

   ![Success Message Screenshot]

   e. You can save the changes into the NVM. In the tool bar, click “RAM to NVM” button, as following

   ![RAM to NVM Icon Screenshot]

   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

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>REFERENCE</th>
<th>PART DESCRIPTION</th>
<th>MANUFACTURER/PART NUMBER</th>
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## PARTS LIST

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### Additional Demo Board Circuit Components

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<td>R1, R3, R5, R6, R7, R14, R15, R18, R20, R24, R27 TO R30, R39, R48, R59, R62, R67, R69, R72, R78, R79, R96, R97, R104 TO R108, R39, R41, R62, R67, R69</td>
<td>RES, OPTIONAL</td>
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### Hardware: for Demo Board Only

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>REFERENCE</th>
<th>DESCRIPTION</th>
<th>MANUFACTURER/PART NUMBER</th>
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<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>E1 TO E24</td>
<td>TESTPOINT, TURRET, 0.062”</td>
<td>MILL-MAX, 2308-2-00-80-00-00-07-0</td>
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<tr>
<td>2</td>
<td>2</td>
<td>JP1, JP2</td>
<td>0.079 SINGLE ROW HEADER, 3 PIN</td>
<td>SAMTEC,TMM-103-02-L-S</td>
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<tr>
<td>3</td>
<td>2</td>
<td>XJP1, XJP2</td>
<td>SHUNT</td>
<td>SAMTEC, 2SN-BK-G</td>
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<tr>
<td>4</td>
<td>2</td>
<td>J1, J3</td>
<td>JACK, BANANA</td>
<td>KEYSTONE 575-4</td>
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<tr>
<td>5</td>
<td>4</td>
<td>J2, J4, J5, J6</td>
<td>STUD, TESTPIN</td>
<td>PEM KFH-032-10</td>
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<td>6</td>
<td>8</td>
<td>J1, J2, J3, J4, J5, J6 (x2)</td>
<td>NUT, BRASS 10-32</td>
<td>ANY #10-32</td>
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<td>7</td>
<td>4</td>
<td>J1, J2, J3, J4, J5, J6</td>
<td>RING, LUG #10</td>
<td>KEYSTONE, 8205, #10</td>
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<tr>
<td>8</td>
<td>4</td>
<td>J1, J2, J3, J4, J5, J6</td>
<td>WASHER, TIN PLATED BRASS</td>
<td>ANY #10, #10EXT BZ TN</td>
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<td>9</td>
<td>2</td>
<td>S$1, SW2</td>
<td>CONN, SUB MINIATURE SLIDE SWITCHES</td>
<td>C&amp;K, JS20201CON</td>
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<td>10</td>
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<td>J7</td>
<td>CONN HEADER 12POS 2MM STR DL PCB</td>
<td>FCI 98414-G06-12ULF</td>
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<td>11</td>
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<td>J10, J11</td>
<td>CONN, BNC, 5PINS</td>
<td>CONNEX, 112404</td>
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<td>12</td>
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<td>J14</td>
<td>HEADER, 4 PINS, SHROUDED</td>
<td>HIROSE, DF3A-4P-2DSA</td>
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<td>13</td>
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<td>J12</td>
<td>CONN RECEPT 2MM DUAL R/A 14POS (F)</td>
<td>SULLINS, NPN072FJFN-RC</td>
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<td>14</td>
<td>1</td>
<td>J13</td>
<td>HEADER 14POS 2MM R/A GOLD (M)</td>
<td>MOLEX, 87760-1416</td>
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<td>15</td>
<td>4</td>
<td>(STAND-OFF)</td>
<td>STAND-OFF, NYLON 0.50” TALL</td>
<td>KEYSTONE, 8833(SNAP ON)</td>
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</tbody>
</table>
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APPROVALS

LINEAR TECHNOLOGY

PCB DES.

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TITLE:

HIGH EFFICIENCY, POLY-PHASE, DC/DC STEP-DOWN MICRO MODULE REGULATOR WITH POWER SYSTEM MANAGEMENT IC NO. REV.

B LTM4676AEY / LTM4630EV 1

DATE:

Thursday, June 04, 2015

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SHEET OF

dc2106bbf

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Figure 7. Circuit Schematic
DEMO MANUAL DC2106B-B

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