

LTM4601HV

5V_{IN} to 28V_{IN}, 12A Step-Down μModule Regulator

DESCRIPTION

Demonstration circuit DC1041A-B features the LTM[®]4601HVEV, a 12A high efficiency, high density switch mode step-down converter. The input voltage range is from 4.5V to 28V. The output voltage is jumper selectable for popular voltages from 0.6V to 5V. The PLLIN pin supports synchronizing the μModule[®] regulator to an external clock. The TRACK/SS pin allows the user to program output ramp-up and ramp-down rates which may coincidentally or ratiometrically track with another

supply's output if desired. Output voltage margining of ±5% from the nominal value is available via the margin control pins MARG0 and MARG1. The LTM4601HV data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC1041A-B.

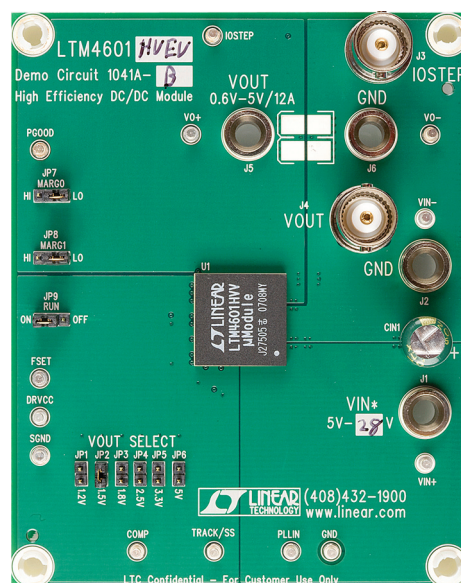
Design files for this circuit board are available at <http://www.linear.com/demo>

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PERFORMANCE SUMMARY (T_A = 25°C)

| PARAMETER | CONDITION | VALUE |
|--|---|----------------------------------|
| Input Voltage Range | | 4.5V to 28V |
| Output Voltage V _{OUT} | Jumper Selectable (Open for 0.6V) | 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5V |
| Maximum Continuous Output Current | Derating is Necessary for Certain V _{IN} , V _{OUT} and Thermal Conditions | 12A DC |
| Default Operating Frequency | | 800kHz |
| External Synchronous Clock Frequency Range | Refer to Data Sheet for Details | 560kHz to 1000kHz |
| Efficiency | V _{IN} = 12V, V _{OUT} = 1.5V, I _{OUT} = 12A | 83%, See Figure 2 |

BOARD PHOTO



dc1041a-bf

DEMO MANUAL DC1041A-B

QUICK START PROCEDURE

Demonstration circuit DC1041A-B is an easy way to evaluate the performance of the LTM4601. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With the power supply off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and power supply voltage within the LTM4601's operating input voltage range.

2. Place jumpers in the following positions for a typical 1.5V_{OUT} application:

| MARG0 | MARG1 | RUN | V _{OUT} SELECT |
|-------|-------|-----|-------------------------|
| LO | LO | ON | 1.5V |

3. Turn on the power at the input. The output voltage should be 1.5V ±1%.

4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters. Output ripple should be measured at J4 with a BNC cable.

5. For optional load transient test, apply an adjustable pulse signal between IOSTEP (E3) and GND pins. Pulse amplitude sets the current step. The pulse signal should have very small duty cycle (<15%) to limit the thermal stress on the transient load circuit. The output transient current can be monitored at BNC connector J3 (10mV/A).

6. For Margining function test, place jumper MARG0 and MARG1 in the configurations shown in the following table, measure the output voltage at J4.

| MARG1 | MARG0 | ΔV _{OUT} |
|-------|-------|-------------------|
| LO | LO | 0 |
| LO | HI | 5% |
| HI | LO | -5% |
| HI | HI | 0 |

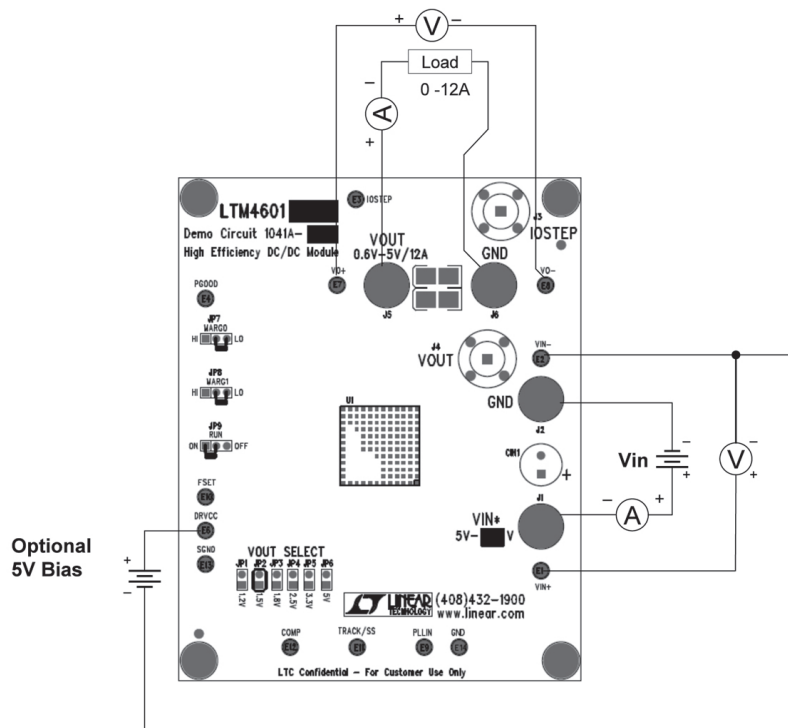


Figure 1. Demo Board Setup

QUICK START PROCEDURE

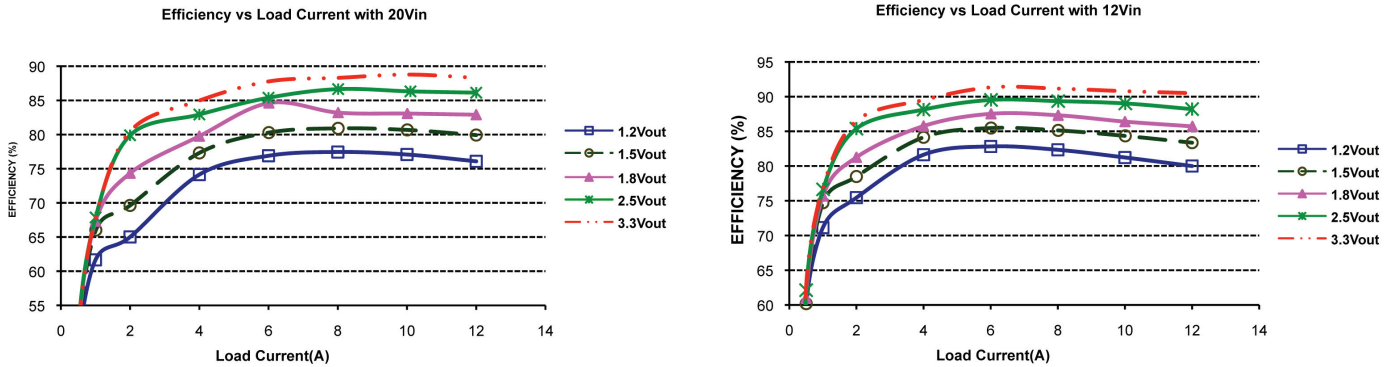
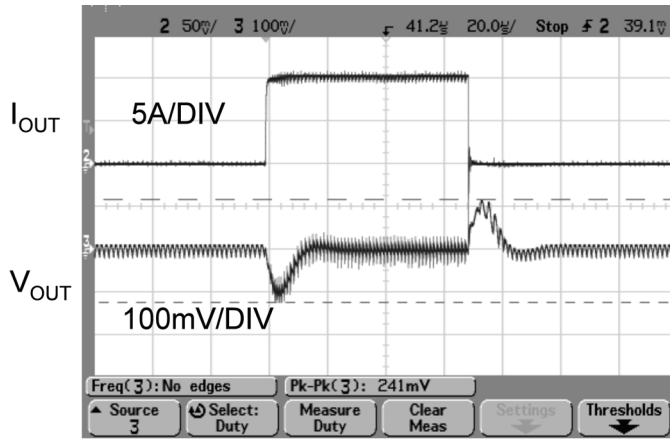


Figure 2. Measured Supply Efficiency with Different V_{IN} and V_{OUT}



$V_{IN} = 12V$
 $V_{OUT} = 1.5V$
 0A TO 10A LOAD STEP
 $C_{OUT} = 1 \times 22\mu F$ CERAMIC, $2 \times 100\mu F$ CERAMIC, $C_5 = 47pF$

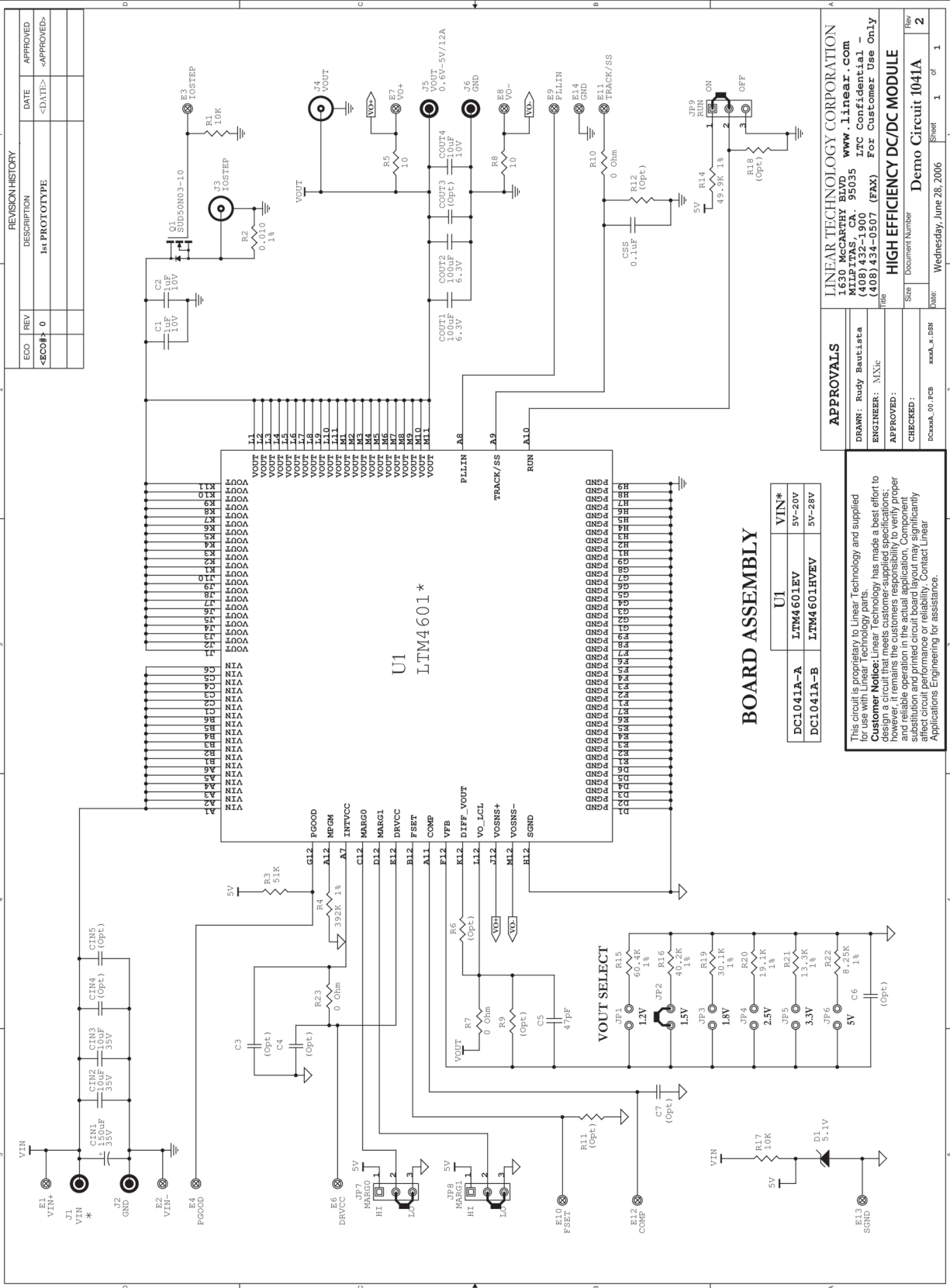
Figure 3. Measured Load Transient Response (0A to 10A Step)

DEMO MANUAL DC1041A-B

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----|-----------------------|--------------------------------------|--|
| Required Circuit Components | | | | |
| 1 | 1 | CIN1 | Cap., Alum 150 μ F 35V 20% | Sanyo 35ME150WXV (now SUNCON 35ME150WXV) |
| 2 | 2 | CIN2, CIN3 | Cap., X7R 10 μ F 35V 20% | Taiyo Yuden GMK316BJ106ML-T |
| 3 | 2 | COU1, COU2 | Cap., X5R 100 μ F 6.3V 20% | Taiyo Yuden JMK432BJ107MU-T |
| 4 | 1 | COU4 | Cap., X5R 10 μ F 10V 10% | Taiyo Yuden LMK316BJ106KL-T |
| 5 | 1 | CSS | Cap., X7R 0.1 μ F 16V 20% | AVX 0603YC104MAT2A |
| 6 | 1 | R4 | Res., Chip 392k 0.1W 1% | AAC CR16-3923FM |
| 7 | 2 | R8,R5 | Res., Chip 10 Ω 0.1W 5% | AAC CR16-100JM |
| 8 | 1 | R19 | Res., Chip 30.1k 0.06W 1% | AAC CR16-3012FM |
| 9 | 1 | U1 | I.C., Volt. Reg. | Linear Technology Corp. LTM4601EV |
| Additional Demo Board Circuit Components | | | | |
| 1 | 0 | CIN4, CIN5 | Cap., 1206 TBD | |
| 2 | 0 | COU3 | Cap., 1210 TBD | |
| 3 | 0 | C3, C4, C5, C6, C7 | Cap., 0603 TBD | |
| 4 | 2 | C1, C2 | Cap., X5R 1 μ F 10V 10% | Taiyo Yuden LMK107BJ105KA |
| 5 | 1 | D1 | Zener Diode, 5.1V | On Semi. MMBZ5231B |
| 6 | 1 | Q1 | MOSFET, N-Channel 30V | Siliconix SUD50N03-10 |
| 7 | 0 | R6, R9, R11, R12, R18 | Res., 0603 TBD | |
| 8 | 2 | R17, R1 | Res., Chip 10k 0.1W 5% | AAC CR16-103JM |
| 9 | 1 | R2 | Res., LRC 0.010 Ω 0.25W 1% | IRC LRF1206-01-R010-F |
| 10 | 1 | R3 | Res., Chip 51k 0.1W 5% | AAC CR16-513JM |
| 11 | 3 | R7, R10, R23 | Res/Jumper, Chip 0 Ω 1/16W 1A | AAC CJ06-000M |
| 12 | 1 | R14 | Res., Chip 49.9k 0.06W 1% | AAC CR16-4992FM |
| 13 | 1 | R15 | Res., Chip 60.4k 0.1W 1% | AAC CR16-6042FM |
| 14 | 1 | R16 | Res., Chip 40.2k 0.1W 1% | AAC CR16-4022FM |
| 15 | 1 | R20 | Res., Chip 19.1k 0.1W 1% | AAC CR16-1912FM |
| 16 | 1 | R21 | Res., Chip 13.3k 0.1W 1% | AAC CR16-1332FM |
| 17 | 1 | R22 | Res., Chip 8.25k 0.1W 1% | AAC CR16-8251FM |

SCHEMATIC DIAGRAM



REVISION HISTORY

| ECD | REV | DESCRIPTION | DATE | APPROVED |
|--------|-----|---------------|--------|------------|
| <ECCO> | 0 | 1st PROTOTYPE | <DATE> | <APPROVED> |

APPROVALS

| | | |
|-----------------------|---|------------------------------------|
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| ENGINEER: M.Nic | File | For Customer Use Only |
| APPROVED: | | |
| CHECKED: xaa.x.gsr | Doc# DC1041A_00 PCB | Demo Circuit 1041A |
| Size: | Document Number | Sheet 1 of 1 |
| Date: | Wednesday, June 28, 2006 | Rev 2 |

BOARD ASSEMBLY

| DC1041A-A | DC1041A-B | U1 | VIN* |
|-----------|-----------|-------------|--------|
| | | LTM4601EV | 5V-20V |
| | | LTM4601EVEV | 5V-28V |

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DEMO MANUAL DC1041A-B

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