

LTM4644EY

Quad 4A Output Step-Down μ Module Regulator

DESCRIPTION

Demonstration circuit 1900A features the [LTM[®]4644EY](#) μ Module[®] regulator, a high-performance high-efficiency quad output step-down regulator. The LTM4644EY has an operating input voltage range of 4V to 14V and is able to provide up to 4A of output current from each of its phases. Each output's voltage is programmable from 0.6V to 5.5V. The LTM4644EY is a DC/DC point of load regulator in a 9mm \times 15mm \times 5.01mm BGA package requiring only a

few input and output capacitors. Output voltage tracking is available through the TRACK/SS pin for supply rail sequencing. External clock synchronization is also available through the CLKIN pin. The LTM4644 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit 1900A.

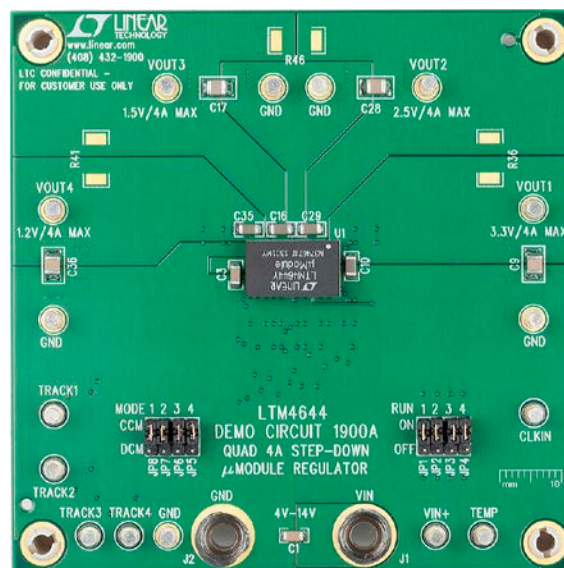
Design files for this circuit board are available at <http://www.linear.com/demo/DC1900A>

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

| PARAMETER | CONDITIONS | VALUE |
|--|---|--|
| Input Voltage Range | | 4V to 14V |
| Output Voltage V_{OUT} | Jumper Selectable | $V_{OUT1} = 3.3\text{VDC}$, $V_{OUT2} = 2.5\text{VDC}$, $V_{OUT3} = 1.5\text{VDC}$, $V_{OUT4} = 1.2\text{VDC}$ |
| Maximum Continuous Load Current per Output | De-rating is necessary for certain operating conditions. See data sheet for details | 4ADC |
| Default Operating Frequency | | 1MHz |
| Efficiency | $V_{IN} = 12\text{V}$, $V_{OUT1} = 3.3\text{V}$, $I_{OUT} = 4\text{A}$ | 89% See Figure 2 |

BOARD PHOTO



DEMO MANUAL DC1900A

QUICK START PROCEDURE

Demonstration circuit 1900A is an easy way to evaluate the performance of the LTM4644EY. Please refer to Figure 1 for test setup connections and follow the procedure below.

1. With power off, place the jumpers in the following positions:

| JP1 | JP2 | JP3 | JP4 |
|------|------|------|------|
| RUN1 | RUN2 | RUN3 | RUN4 |
| ON | ON | ON | ON |

| JP8 | JP7 | JP6 | JP5 |
|-------|-------|-------|-------|
| MODE1 | MODE2 | MODE3 | MODE4 |
| CCM | CCM | CCM | CCM |

2. Before connecting input supply, loads and meters, preset the input voltage supply to be between 4.5V to 14V. Preset the load currents to 0A.

3. With power off, connect the loads, input voltage supply and meters as shown in Figure 1.
4. Turn on input power supply. The output voltage meters for each phase should display the programmed output voltage within $\pm 2\%$.
5. Once the proper output voltage is established, adjust the load currents for each phase within the 0A to 4A range and observe the load regulation, efficiency, and other parameters.
6. To observe increased light load efficiency place a Mode pin jumper (JP5-JP8) in the DCM Mode position.

Note: Optional jumper positions are available on the DC1900A to allow for easy setup to evaluate parallel operation of the LTM4644. For example, to parallel all 4 outputs of the LTM4644 together stuff 0Ω jumpers for R32-R46.

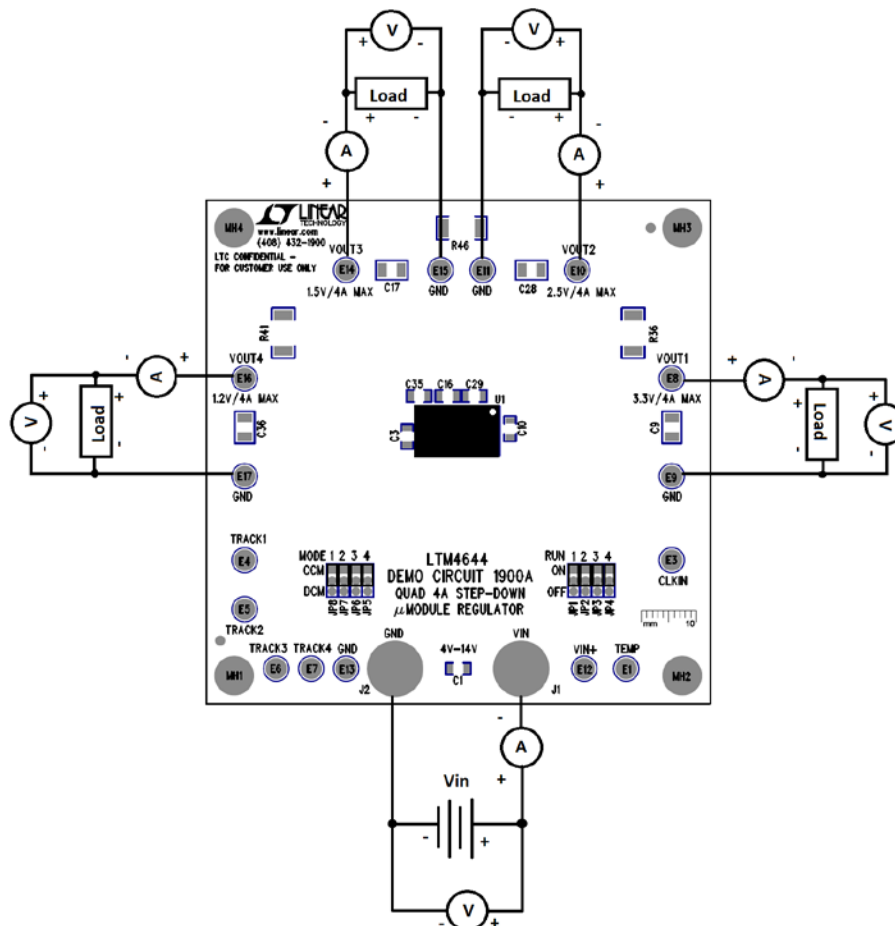


Figure 1. Test Setup of DC1900A

QUICK START PROCEDURE

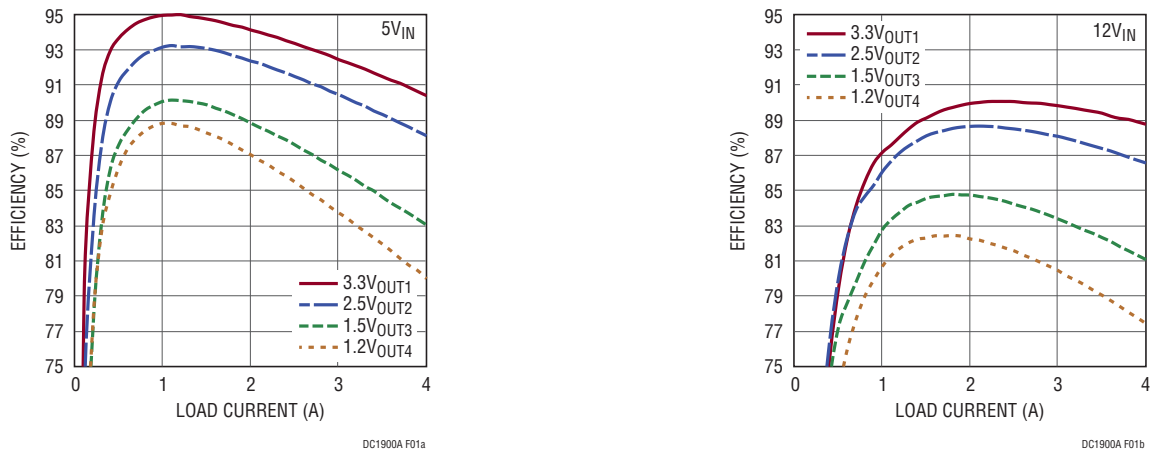


Figure 2. Measured Supply Efficiency at $5V_{IN}$ and $12V_{IN}$

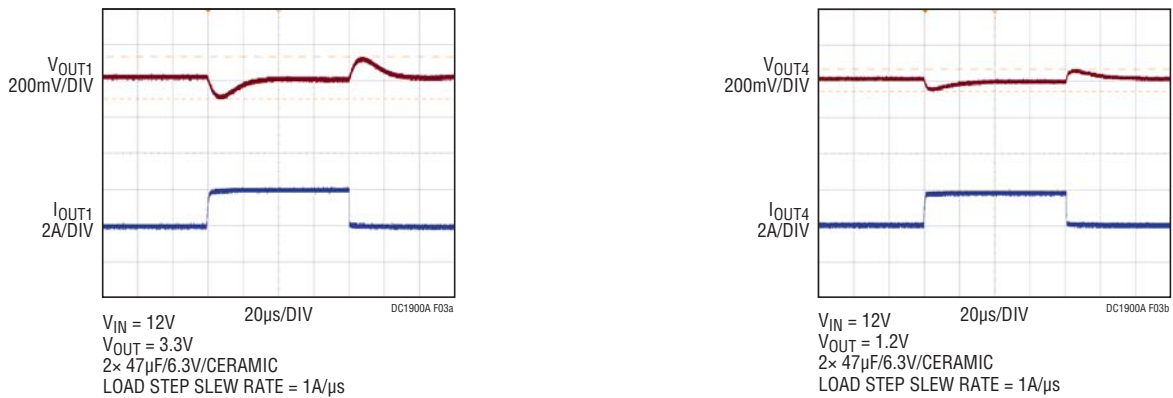


Figure 3. Measured $V_{OUT1} = 3.3V$ and $V_{OUT4} = 1.2V$ Load Transient Responses (2A to 4A Load Step)



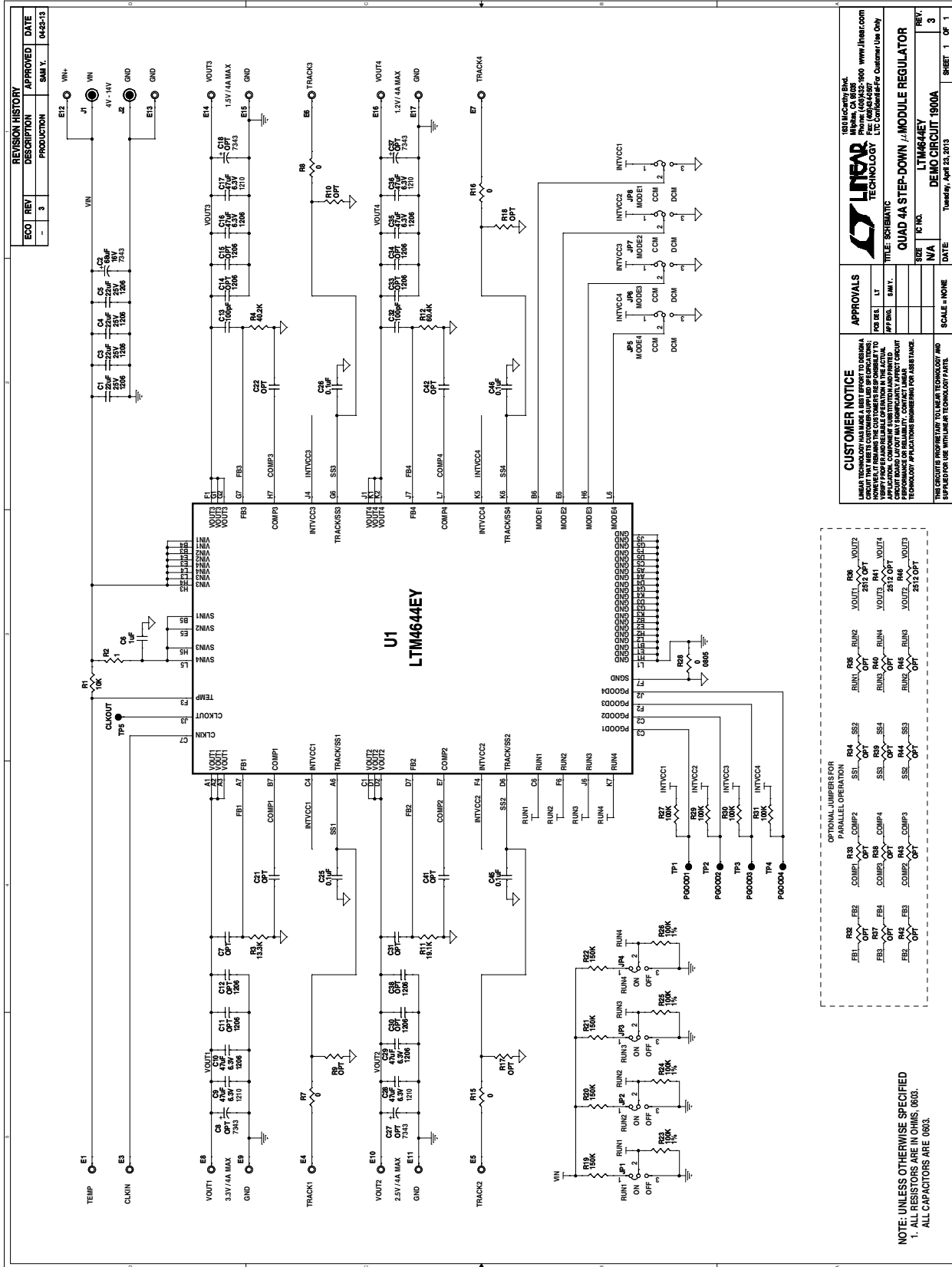
Figure 4. Measured Thermal Capture with All Phases at Full Load (4A)

DEMO MANUAL DC1900A

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----|--|--|---------------------------------|
| Required Circuit Components | | | | |
| 1 | 2 | C1, C3 | CAP, 1206, CER. 22 μ F 25V X5R 20% | MURATA, GRM31CR61E226KE15L |
| 2 | 1 | C6 | CAP, 0603, X5R, 1 μ F, 16V 10% | AVX, 0603YD105KAT2A |
| 3 | 4 | C9, C17, C28, C36 | CAP, 1210 CER. 47 μ F 6.3V | AVX, 12106D476MAT2A |
| 4 | 4 | C10, C16, C29, C35 | CAP, 1206, X5R, 47 μ F, 6.3V, 20% | TAIYO YUDEN, JMK316BJ476ML |
| 5 | 1 | R3 | RES, 0603, 13.3k Ω 1% 1/10W | VISHAY CRCW060313K3FKEA |
| 6 | 1 | R4 | RES, 0603, 40.2k Ω 1% 1/10W | VISHAY CRCW060340K2FKEA |
| 7 | 2 | R11 | RES, 0603, 19.1k Ω 1% 1/10W | VISHAY CRCW060319K1FKEA |
| 8 | 1 | R12 | RES, 0603, 60.4k Ω 1% 1/10W | VISHAY CRCW060360K4FKEA |
| 9 | 1 | U1 | LTM4644EY, BGA-15X9-5.01 | LINEAR TECH.CORP. LTM4644EY |
| Additional Demo Board Circuit Components | | | | |
| 1 | 2 | C4, C5 | CAP, 1206, CER. 22 μ F 25V X5R 20% | MURATA, GRM31CR61E226KE15L |
| 2 | 1 | C2 | CAP, 7343, POSCAP 68 μ F 16V | SANYO, 16TQC68MYF |
| 3 | 6 | C7, C21, C22, C31, C41, C42 | CAP, 0603, OPTION | OPTION |
| 4 | 4 | C8, C18, C27, C37 | CAP, 7343, POSCAP, OPTION | OPTION |
| 5 | 8 | C11, C12, C14, C15, C30, C38, C33, C34 | CAP, 1206, CER., OPTION | OPTION |
| 6 | 2 | C13, C32 | CAP, 0603, CER., 100PF | AVX 06033C101KAT2A |
| 7 | 4 | R7, R8, R15, R16 | RES, 0603, 0 Ω 1% 1/10W | VISHAY, CRCW06030000Z0ED |
| 8 | 1 | R28 | RES, 0805, 0 Ω 5% 1/16W | VISHAY, CRCW08050000Z0EA |
| 9 | 4 | R19, R20, R21, R22 | RES, 0603, 150k Ω 5% 1/10W | VISHAY CRCW0603150KJNEA |
| 10 | 4 | R23, R24, R25, R26 | RES, 0603, 100k Ω 5% 1/10W | VISHAY CRCW0603100KJNEA |
| 11 | 4 | R9, R10, R17, R18 | RES, 0603, OPTION | OPTION |
| 12 | 12 | R32-R35, R37-R40, R42-R45 (OPT) | RES, 0603, OPTION | OPTION |
| 13 | 3 | R36, R41, R46 (OPT) | RES, 2512, 0 Ω , OPTION | OPTION |
| 14 | 4 | C25, C26, C45, C46 | CAP, 0603, CER. 10 μ F 50V X7R | TDK, C1608X7R1H104M |
| 15 | 1 | R1 | RES., 0603, CHIP, 10k, 1% | VISHAY, CRCW060310K0FKED |
| 16 | 1 | R2 | RES, 0603, 1 Ω 5% 1/10W | VISHAY, CRCW06031R00JNEA |
| 17 | 4 | R27, R29, R30, R31 | RES, 0603, 100k Ω 5% 1/10W | VISHAY CRCW0603100KJNEA |
| Hardware | | | | |
| 1 | 16 | E1, E3-E17 | TESTPOINT, TURRET 0.094" | MILLMAX 2501-2-00-80-00-00-07-0 |
| 2 | 2 | J1, J2 | JACK, BANANA | KEYSTONE 575-4 |
| 3 | 8 | JP1-JP8 | JMP, 0.079 SINGLE ROW HEADER, 3 PIN | SULLINS, NRPNO31PAEN-RC |
| 4 | 8 | XJP1-XJP8 | SHUNT, .079" CENTER | SAMTEC, 2SN-BK-G |
| 5 | 4 | STAND-OFFS | STAND-OFF, SNAP ON, NYLON 0.375" TALL | KEYSTONE, 8832(SNAP ON) |

SCHEMATIC DIAGRAM



DEMO MANUAL DC1900A

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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