LTM4644EY
Quad 4A Output Step-Down µModule Regulator

DESCRIPTION

Demonstration circuit 1900A (DC1900A) features the LTM®4644EY µModule® 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 × 15mm × 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 the DC1900A demo circuit board.

Design files for this circuit board are available.

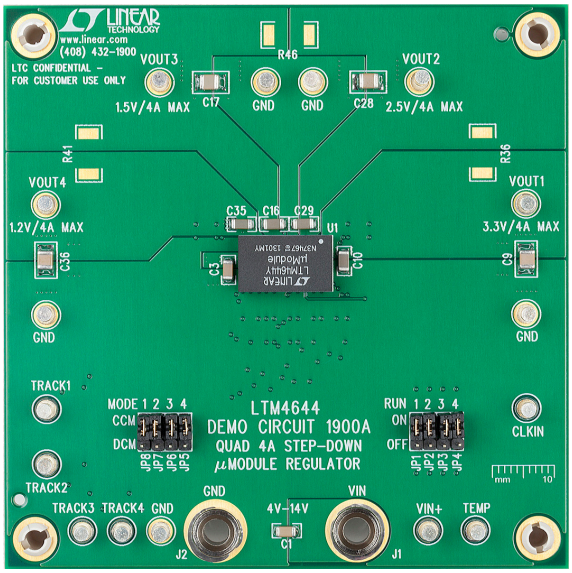
PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		4V to 14V
Output Voltage V_{OUT}	Jumper Selectable	V_{OUT1} = 3.3VDC, V_{OUT2} = 2.5VDC, V_{OUT3} = 1.5VDC, V_{OUT4} = 1.2VDC
Maximum Continuous Load Current per Output	De-Rating is Necessary for Certain Operating Conditions (See Data Sheet for More Details)	4ADC
Default Operating Frequency		1MHz
Efficiency	V_{IN} = 12V, V_{OUT1} = 3.3V, I_{OUT} = 4A	89% See Figure 2

BOARD PHOTO

Part marking is either ink mark or laser mark



QUICK START PROCEDURE

The DC1900A demo circuit board is an easy way to evaluate the performance of the LTM4644EY. See 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 ± 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.

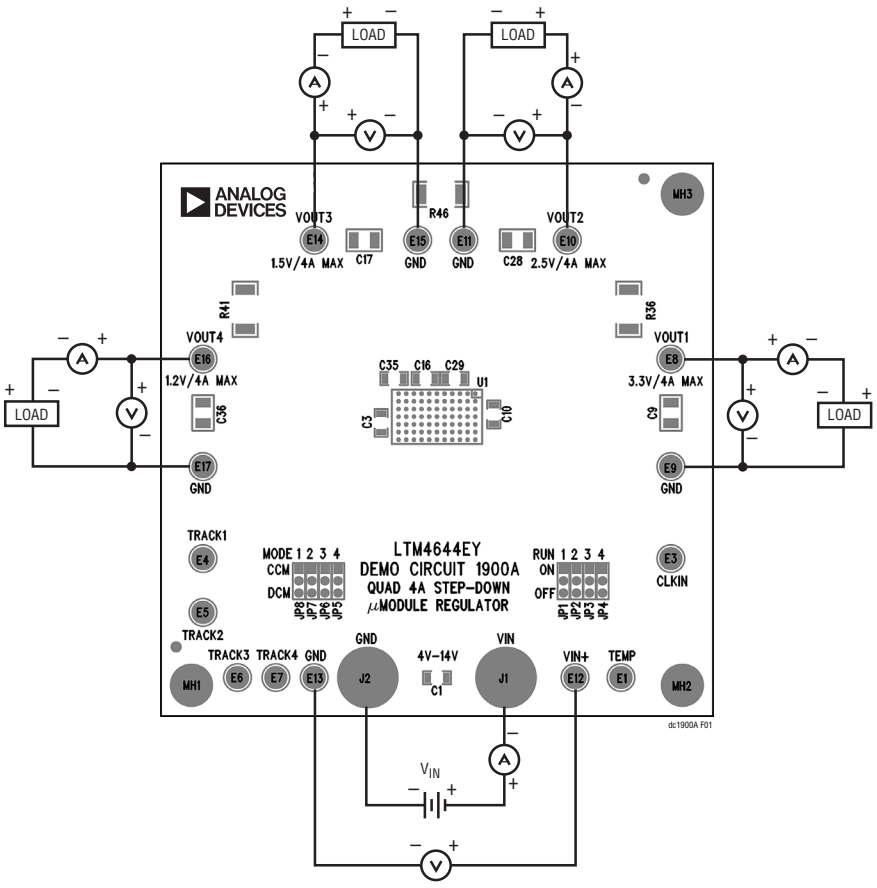
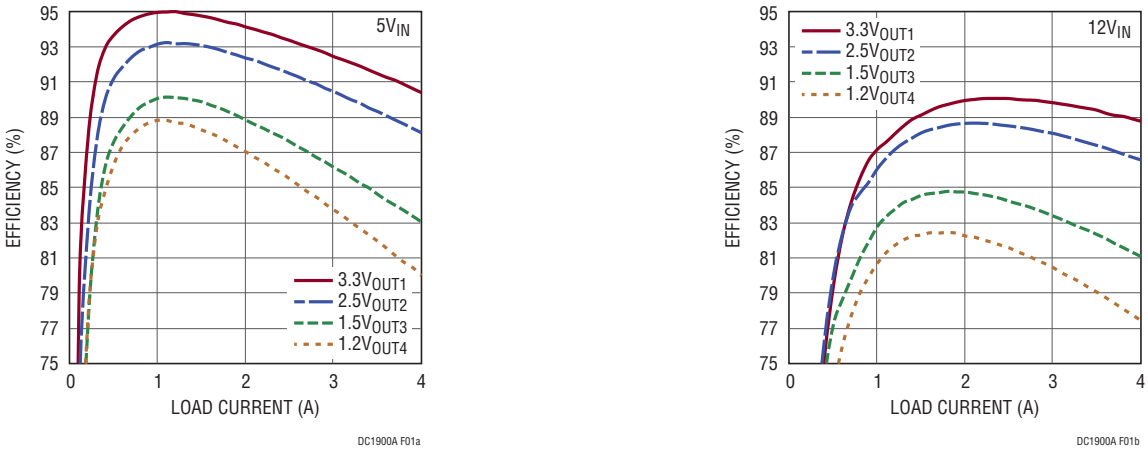


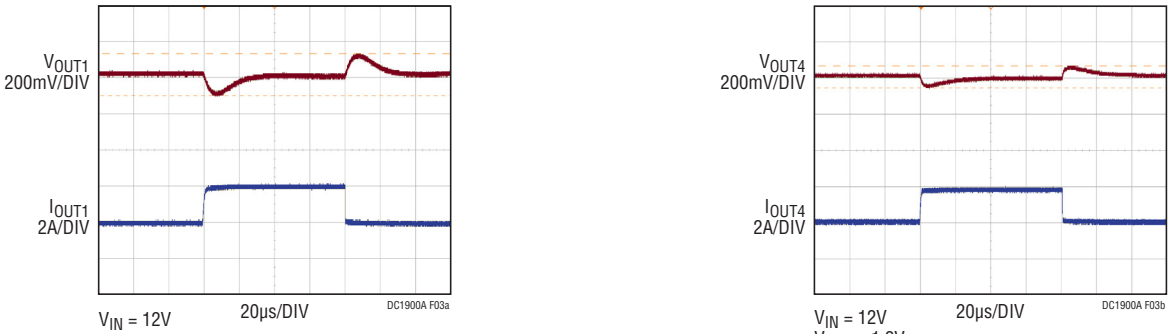
Figure 1. Test Setup of DC1900A

QUICK START PROCEDURE



(a) (b)

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



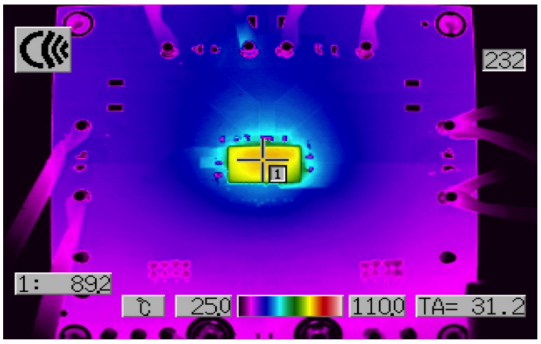
V_{IN} = 12V
V_{OUT} = 3.3V
2× 47µF/6.3V/CERAMIC
LOAD STEP SLEW RATE = 1A/µs

(a)

V_{IN} = 12V
V_{OUT} = 1.2V
2× 47µF/6.3V/CERAMIC
LOAD STEP SLEW RATE = 1A/µs

(b)

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



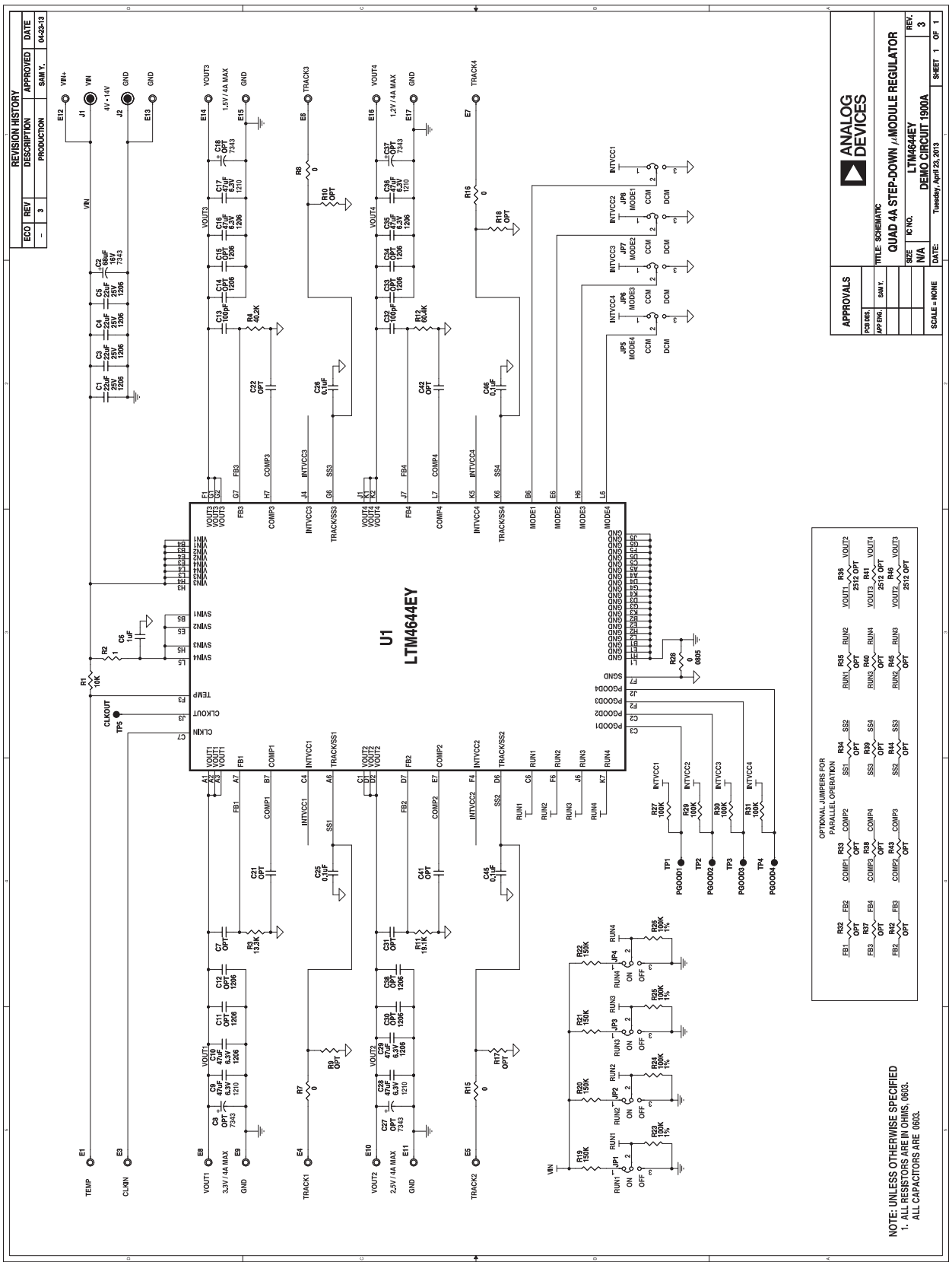
V_{IN} = 12V
V_{OUT1} = 3.3V, V_{OUT2} = 2.5V, V_{OUT3} = 1.5V, V_{OUT4} = 1.2V
NATURAL CONVECTION
AMBIENT TEMPERATURE = 31.2°C

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

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C3	CAP, 1206, CER. 22µF 25V X5R 20%	MURATA, GRM31CR61E226KE15L
2	1	C6	CAP, 0603, X5R, 1µF, 16V 10%	AVX, 0603YD105KAT2A
3	4	C9, C17, C28, C36	CAP, 1210 CER. 47µF 6.3V	AVX, 12106D476MAT2A
4	4	C10, C16, C29, C35	CAP, 1206, X5R, 47µF, 6.3V, 20%	TAIYO YUDEN, JMK316BJ476ML
5	1	R3	RES, 0603, 13.3kΩ 1% 1/10W	VISHAY CRCW060313K3FKEA
6	1	R4	RES, 0603, 40.2kΩ 1% 1/10W	VISHAY CRCW060340K2FKEA
7	2	R11	RES, 0603, 19.1kΩ 1% 1/10W	VISHAY CRCW060319K1FKEA
8	1	R12	RES, 0603, 60.4kΩ 1% 1/10W	VISHAY CRCW060360K4FKEA
9	1	U1	LTM4644EY, BGA-15X9-5.01	ANALOG DEVICES LTM4644EY
Additional Demo Board Circuit Components				
1	2	C4, C5	CAP, 1206, CER. 22µF 25V X5R 20%	MURATA, GRM31CR61E226KE15L
2	1	C2	CAP, 7343, POSCAP 68µF 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, 0Ω 1% 1/10W	VISHAY, CRCW06030000Z0ED
8	1	R28	RES, 0805, 0Ω 5% 1/16W	VISHAY, CRCW08050000Z0EA
9	4	R19, R20, R21, R22	RES, 0603, 150kΩ 5% 1/10W	VISHAY CRCW0603150KJNEA
10	4	R23, R24, R25, R26	RES, 0603, 100kΩ 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, 0Ω, OPTION	OPTION
14	4	C25, C26, C45, C46	CAP, 0603, CER. 10µF 50V X7R	TDK, C1608X7R1H104M
15	1	R1	RES., 0603, CHIP, 10k, 1%	VISHAY, CRCW060310K0FKED
16	1	R2	RES, 0603, 1Ω 5% 1/10W	VISHAY,CRCW06031R00JNEA
17	4	R27, R29, R30, R31	RES, 0603, 100kΩ 5% 1/10W	VISHAY CRCW0603100KJNEA
Hardware: For Demo Board Only				
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, NRPN031PAEN-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



Rev. A

REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER
A	08/24	Updated Description	1
		Updated the Test Setup Diagram (Figure 1).	2
		Updated Schematic Diagram	5

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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