LTM4691
Low V_{IN}, High Efficiency, Dual 2A Step-down µModule DC/DC Converter

DESCRIPTION

Demonstration circuit 2910A is low V_{IN}, high efficiency, and dual 2A output µModule DC/DC converter. The board operates by default at a fixed 2MHz and can be synchronized from 1MHz to 3MHz via the MODE/SYNC pin. With its high switching frequency and current mode architecture, a fast transient response to line and load changes is possible without sacrificing stability. The DC2910A can be used in forced continuous mode or pulse skip mode for low noise, or in burst mode operation for high efficiency at light loads. The demo board features the LTM®4691, which is available in a low profile 3mm x 4mm x 1.2mm LGA package. Please see the LTM4691 datasheet for more detailed information.

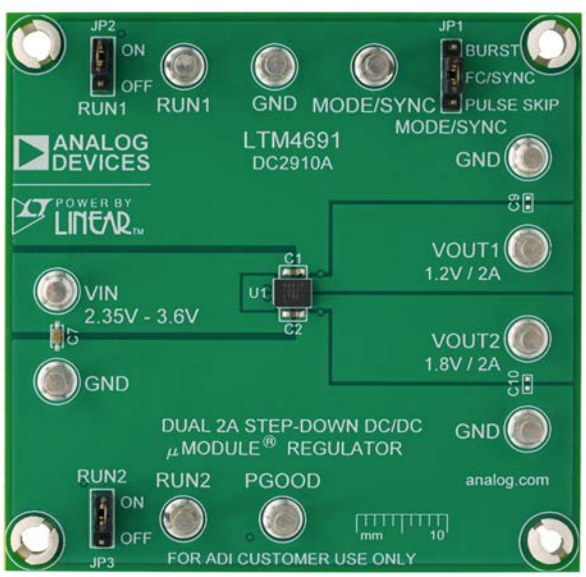
It is recommended to read the data sheet for the LTM4691 prior to making any changes to the DC2910A.

Design files for this circuit board are available.

PERFORMANCE SUMMARY **Specifications are at T_A = 25°C**

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		2.35V to 3.6V
Output Voltage, V_{OUT}	V_{IN} = 2.35V – 3.6V, I_{OUT} = 0A to 2A	V_{OUT1} = 1.2V V_{OUT2} = 1.8V
Maximum Output Current, I_{OUT}	V_{IN} = 2.35V – 3.6V	2A
Typical Efficiency	V_{IN} = 3.3V, V_{OUT1} = 1.2V, I_{OUT} = 2A V_{IN} = 3.3V, V_{OUT2} = 1.8V, I_{OUT} = 2A	84% 88%
Peak Efficiency	V_{IN} = 3.3V, V_{OUT1} = 1.2V V_{IN} = 3.3V, V_{OUT2} = 1.8V	89% 92%
Switching Frequency		2MHz

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit 2910A is easy to set up to evaluate the performance of the LTM4691. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to V_{IN} (2.35V-3.6V) and GND (input return).
2. Connect the output loads between V_{OUT} and GND (Initial load: no load). Refer to Figure 1.
3. Connect the DVMs to the input and output.
4. Check the default jumper position: JP2 (RUN1): OFF; JP3 (RUN2): OFF.
5. Turn on the input power supply and adjust voltage to 2.35V – 3.6V;

   NOTE: Make sure that the input voltage does not exceed 4.0V.
6. Change the following jumpers' position: JP2: ON; JP3: ON.
7. Check for the proper output voltages from V_{OUT} to GND turrets.
8. Once the proper output voltage is established, adjust the loads within the operating range and measure the efficiency, output ripple voltage and other parameters.
9. After completing all tests, adjust the load to 0A, power off the input power supply.

NOTES:

1. 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.

QUICK START PROCEDURE

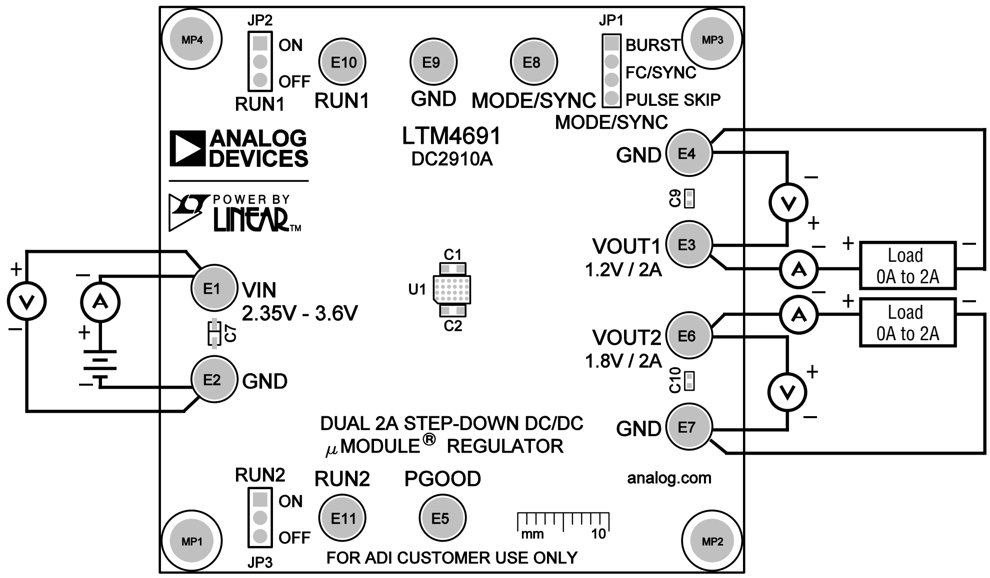


Figure 1. Proper Measurement Equipment Setup

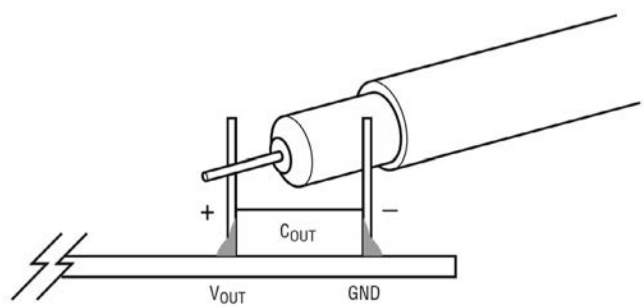


Figure 2. Measuring Output Voltage Ripple

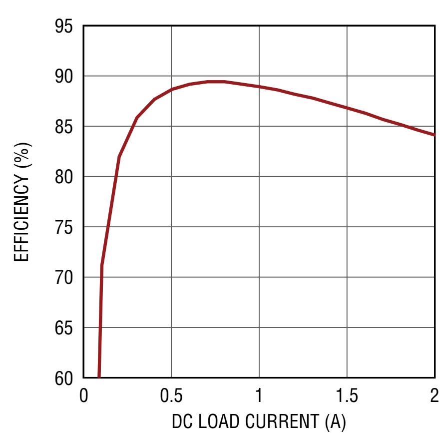


Figure 3. Efficiency vs. Load Current at V_{IN} = 3.3V, V_{OUT1} = 1.2V, f_{SW} = 2MHz

QUICK START PROCEDURE

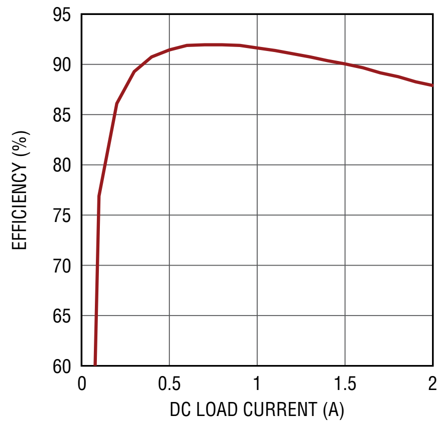


Figure 4. Efficiency vs. Load Current at V_{IN} = 3.3V, V_{OUT2} = 1.8V, f_{SW} = 2MHz

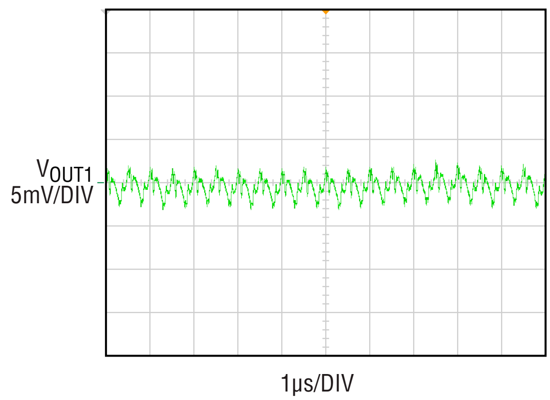


Figure 5. Output Voltage Ripple at V_{IN} = 3.3V, V_{OUT1} = 1.2V, f_{SW} = 2MHz

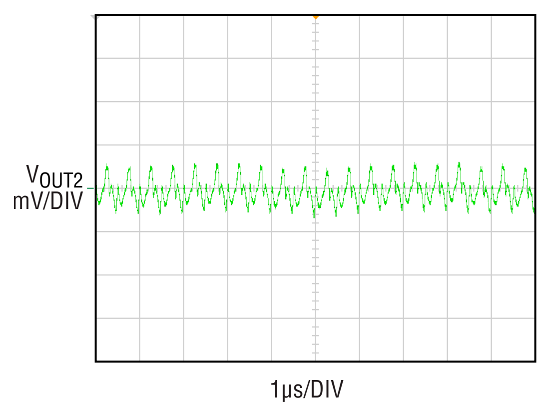


Figure 6. Output Voltage Ripple at V_{IN} = 3.3V, V_{OUT2} = 1.8V, f_{SW} = 2MHz

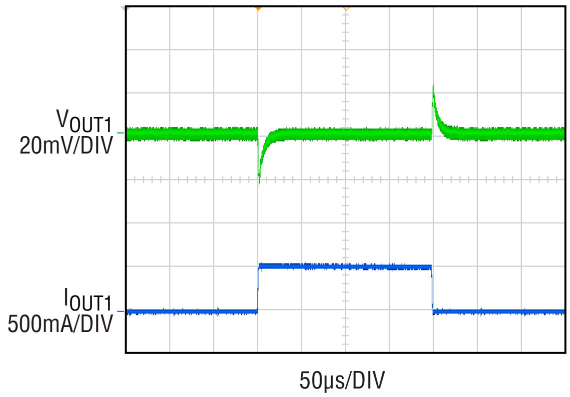


Figure 7. Load Step at V_{IN} = 3.3V, V_{OUT1} = 1.2V, f_{SW} = 2MHz

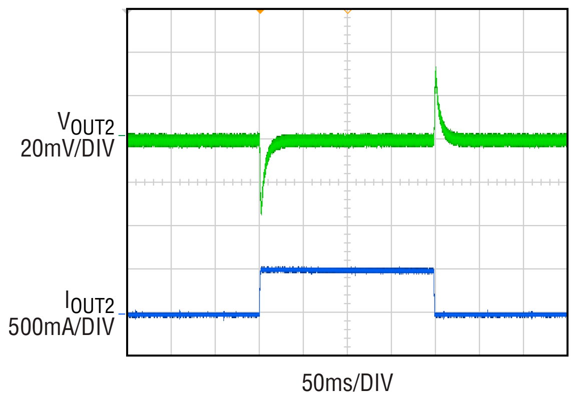


Figure 8. Load Step at V_{IN} = 3.3V, V_{OUT2} = 1.8V, f_{SW} = 2MHz

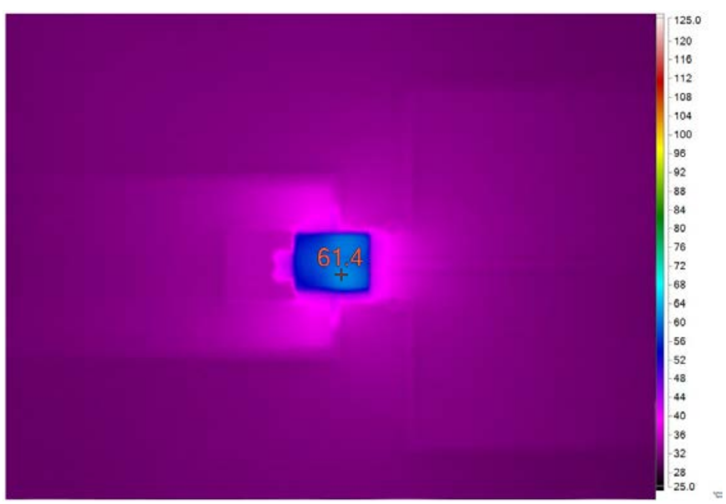
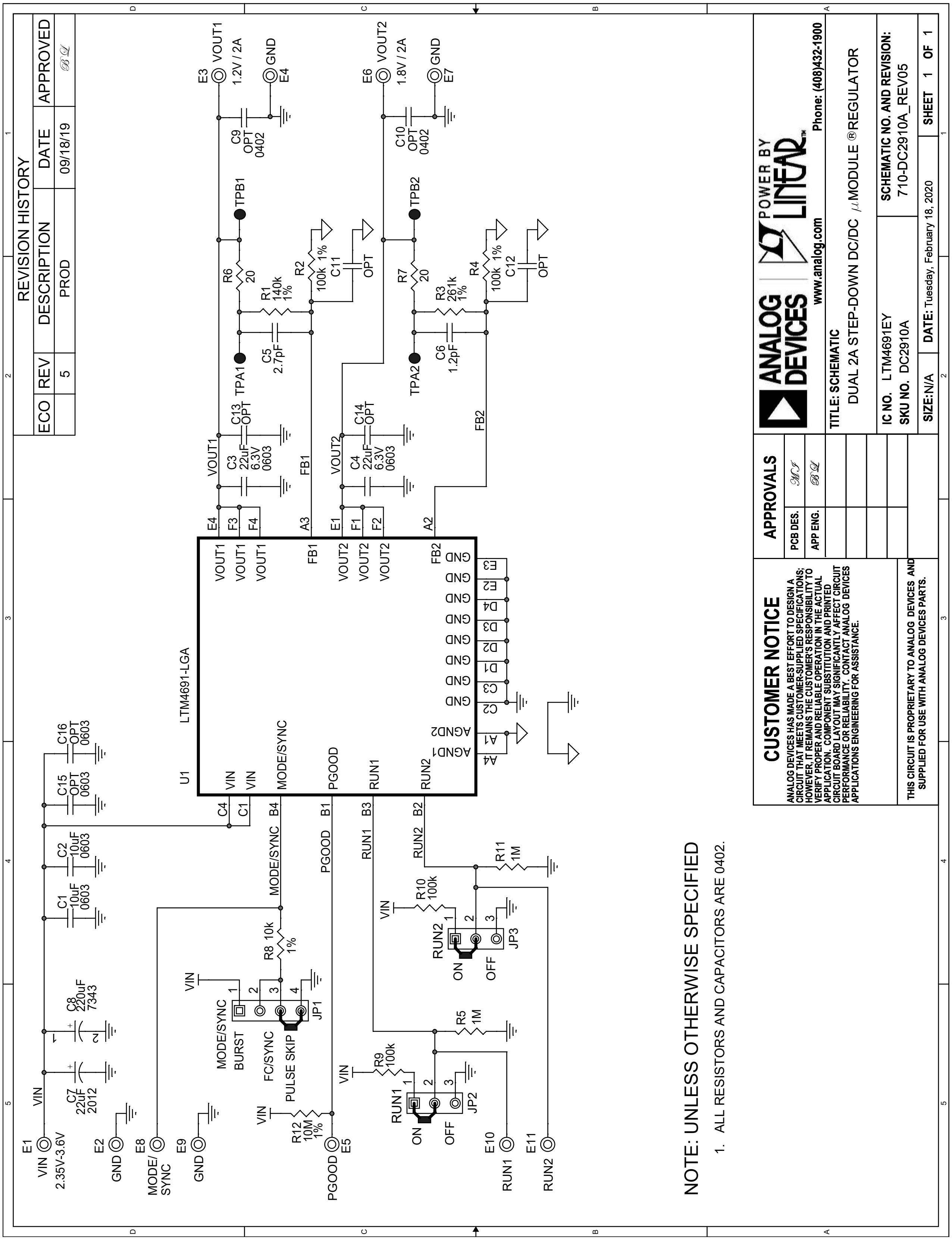


Figure 9. Thermal performance at V_{IN} = 3.3V, V_{OUT1} = 1.2V, V_{OUT2} = 1.8V, I_{OUT1} = 2A, I_{OUT2} = 2A T_A = 23°C, No Forced Airflow

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C2	CAP., 10uF, X5R, 16V, 10%, 0603	MURATA, GRM188R61C106KAALD
2	2	C3, C4	CAP., 22uF, X6S, 6.3V, 20%, 0603	MURATA, GRM188C80J226ME15D
3	1	C5	CAP., 2.7pF, C0G, 50V, +/-0.25pF, 0402	MURATA, GJM1555C1H2R7CB01D
4	1	C6	CAP., 1.2pF, C0G, 50V, +/-0.05pF, 0402	MURATA, GJM1555C1H1R2WB01D
5	1	C7	CAP., 22uF, TANT. POSCAP, 6.3V, 20%, 2012 (0805) S09, 150mOHM, TPU, NO SUBS. ALLOWED	KEMET, T529P226M006AAE150
6	1	C8	CAP., 220uF, TANT. POSCAP, 6.3V, 20%, 7343, 18mOHMS, TPE, NO SUBS. ALLOWED	PANASONIC, 6TPE220MI
7	1	R1	RES., 140k OHMS, 1%, 1/16W, 0402, AEC-Q200	VISHAY, CRCW0402140KFKED
8	2	R2, R4	RES., 100k OHMS, 1%, 1/10W, 0402, AEC-Q200	PANASONIC, ERJ2RKF1003X
9	1	R3	RES., 261k OHMS, 1%, 1/16W, 0402	VISHAY, CRCW0402261KFKED
10	2	R5, R11	RES., 1M OHM, 5%, 1/16W, 0402	VISHAY, CRCW04021M00JNED
11	2	R6, R7	RES., 20 OHMS, 1%, 0.063W, 0402	VISHAY, CRCW040220R0FKED
12	1	R8	RES., 10k OHMS, 1%, 1/10W, 0402	PANASONIC, ERJ2RKF1002X
13	2	R9, R10	RES., 100k OHMS, 5%, 1/16W, 0402, AEC-Q200	VISHAY, CRCW0402100KJNED
14	1	R12	RES., 10M OHMS, 1%, 1/16W, 0402	VISHAY, CRCW040210M0FKED
15	1	U1	IC, Dual 2A Step-Down uMODULE REG, 24-PIN LGA	ANALOG DEVICES, LTM4691EY#PBF
Additional Demo Board Circuit Components				
1	0	C9-C12	CAP., OPTION, 0402	
2	0	C13-C16	CAP., OPTION, 0603	
Hardware: For Demo Board Only				
1	11	E1-E11	TEST POINT, TURRET, 0.094", MTG. HOLE	MILL-MAX, 2501-2-00-80-00-00-07-0
2	2	JP2, JP3	CONN., HDR, MALE, 1x3, 2mm, VERT, STR, THT	WURTH ELEKTRONIK, 62000311121
3	4	MP1-MP4	STANDOFF, NYLON, SNAP-ON, 0.375"	KEYSTONE, 8832
4	3	XJP1-XJP3	CONN., SHUNT, FEMALE, 2 POS, 2mm	WURTH ELEKTRONIK, 60800213421

SCHEMATIC DIAGRAM



Rev. 0

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.