3.6 V Input, Dual Output μModule Buck Regulator Produces 2 A per Channel in a 3 mm × 4 mm Footprint

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Introduction

The LTM4691 is a high efficiency, dual output step-down μModule® buck regulator capable of 2 A continuous output current for each channel from input voltages between 2.25 V and 3.6 V. This switch-mode power supply comes in a tiny 3 mm × 4 mm × 1.18 mm LGA package. This small footprint comprises the switching controller, power FETs, inductors, and all supporting components. Each output is independently resistor programmable from 0.5 V to 2.5 V.

Figure 1. The small profile of the LTM4691 can be seen when placed next to a thin coin and a 1210 sized ceramic capacitor.

The LTM4691 can deliver 2 A per output with just a few small capacitors and resistors. The μModule regulator includes internal feedback loop compensation, reducing the number and size of additional components. The switching frequency defaults to 2 MHz without any external component or input, but it can be synchronized to a 1 MHz to 3 MHz external clock. To maximize the performance of the feedback loop, only a few small external capacitors need be added to complete the internally compensated loop—yielding sufficient stability margins and good transient performance. Other features include a PGOOD signal, output overvoltage protection, overtemperature protection, precision run thresholds, and output short-circuit protection.

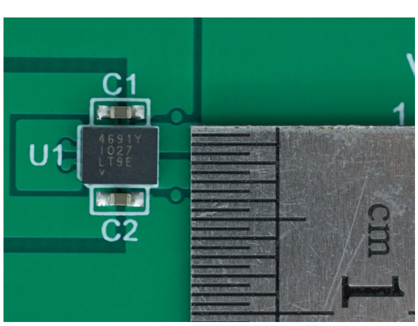

Figure 2. The small LTM4691 on the DC2910A demoboard. Other than the two input capacitors shown, output voltage setting resistors and a couple capacitors populate the back of the board.

Small Solution Using All-Ceramic Capacitors

Figure 3 shows the scheme for a compact, all-ceramic capacitor solution, which takes maximum advantage of the internal circuitry of the LTM4691. Figure 2 shows a photo of the tiny solution. Figure 4, Figure 5, Figure 6, and Figure 7 show the thermal performance, efficiency, and load step performance for a DC2910A demo board.

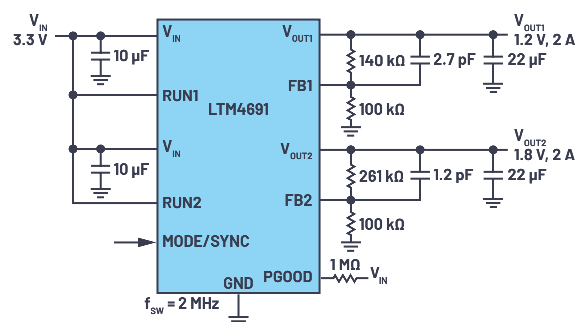

Figure 3. A simplified schematic for the LTM4691 set up for V_{IN} = 3.3 V, V_{OUT1} = 1.2 V, V_{OUT2} = 1.8 V, and f_{SW} = 2 MHz.

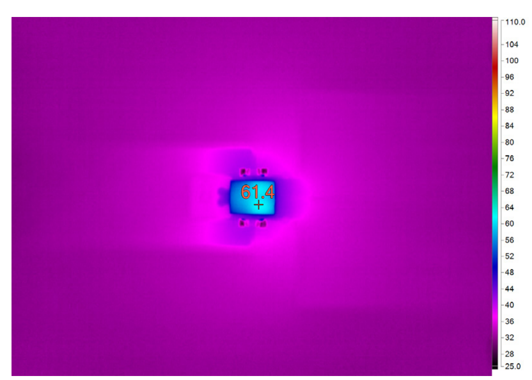

Figure 4. LTM4691 V_{IN} = 3.3 V, V_{OUT1} = 1.2 V, V_{OUT2} = 1.8 V, f_{SW} = 2 MHz, I_{OUT1} = 2 A, I_{OUT2} = 2 A, and Ta = 23°C, with no forced airflow.

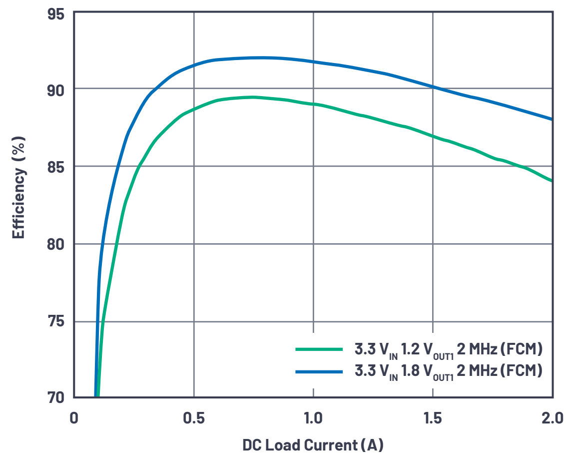

Figure 5. LTM4691 V_{IN} = 3.3 V, V_{OUT1} = 1.2 V, V_{OUT2} = 1.8 V, and f_{SW} = 2 MHz efficiency curves.

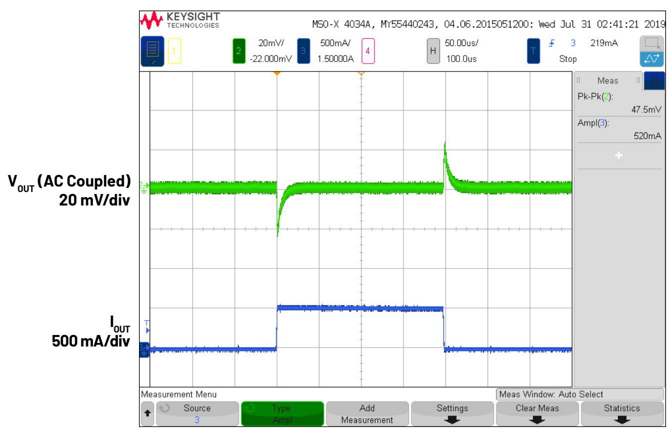

Figure 6. Load step at V_{IN} = 3.3 V, V_{OUT} = 1.2 V, and f_{SW} = 2 MHz.

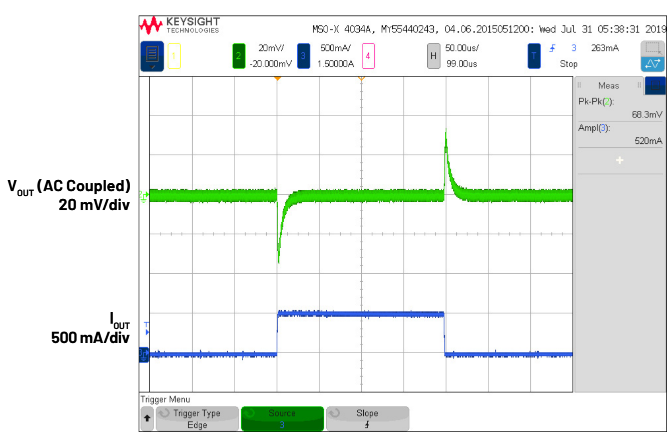

Figure 7. Load step at V_{IN} = 3.3 V, V_{OUT} = 1.8 V, and f_{SW} = 2 MHz.

Conclusion

The LTM4691's compact footprint and low profile enable it to fit tight spaces. Arguably just as important for compact designs: the LTM4691's thermal performance and efficiency are high, minimizing the need for bulky thermal mitigation components. Likewise, transient performance and output stability are not sacrificed to fit the tiny package.

About the Author

Brian Lin is an applications engineer who studied electrical engineering at California Polytechnic State University in San Luis Obispo. When not working, Brian enjoys watching sports, looking for cannolis, and the Oxford comma. He can be reached at *shouee.lin@analog.com*.

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