

DESIGN NOTES

Dual 8A DC/DC μ Module Regulator Is Easily Parallelled for 16A

Design Note 446

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Two Independent 8A Regulator Systems in a Single Package

The LTM[®]4616 is a dual input, dual output DC/DC μ Module[™] regulator in a 15mm × 15mm × 2.8mm LGA surface mount package. Only a few external components are needed since the switching controller, MOSFETs, inductor and other support components are integrated within the tiny package.

Both regulators feature an input supply voltage range of 2.375V to 5.5V and an adjustable output voltage range of 0.6V to 5V with up to 8A of continuous output current (10A peak). For higher output current designs, the LTM4616 can operate in a 2-phase parallel mode allowing the part to deliver a total output current of 16A. The default switching frequency is set to 1.5MHz, but can be adjusted to either 1MHz or 2MHz via the PLLLPF pins. Moreover, CLKIN can be externally synchronized from 750kHz to 2.25MHz. The device supports output voltage tracking for supply rail

sequencing. Safety features include protection against short circuit, overvoltage and thermal shutdown conditions.

Simple and Efficient

The LTM4616 can be used as completely independent dual switching regulators with different inputs and outputs or paralleled to provide a single output. Figure 1 shows a typical design for a 5V common input and two independent outputs, 1.8V and 1.2V. Figure 2 shows the efficiency of the circuit at both 5V and 3.3V inputs.

Few external components are needed since the integrated output capacitors can accommodate load steps to the full 8A. Each output voltage is set by a single set resistor from FB1 (or FB2) to GND. In parallel operation, the FB pins can be tied together with a single resistor for adjustable output voltage.

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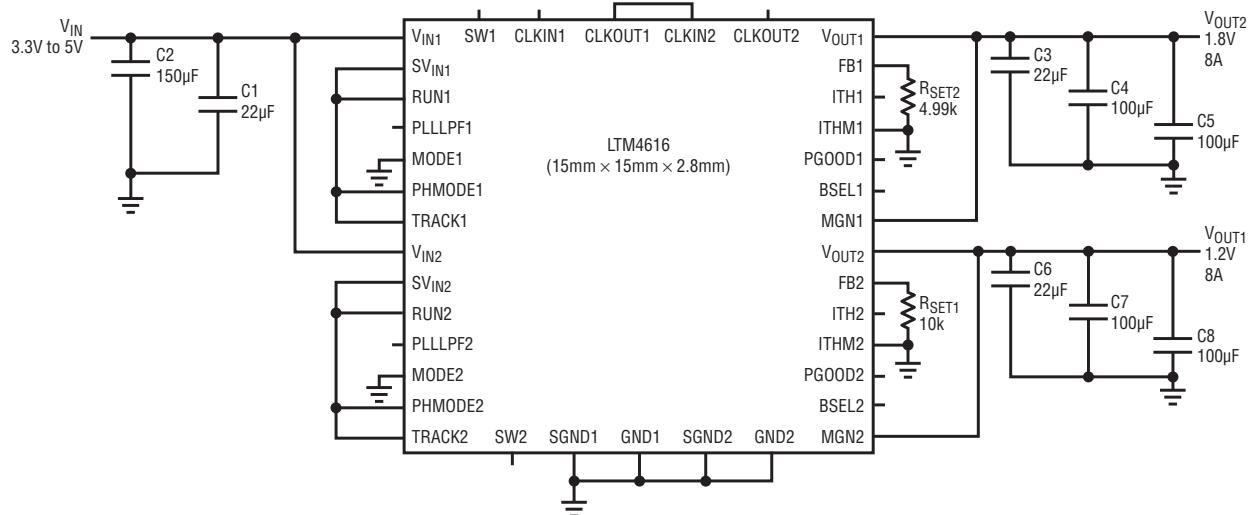


Figure 1. Dual Output LTM4616 for a Single 3.3V to 5V Input, Independent 1.8V and 1.2V Outputs at 8A Each

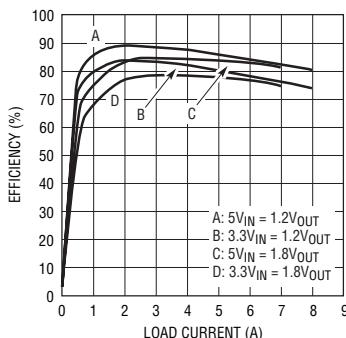


Figure 2. LTM4616 Efficiency: Dual Output

Parallel Operation for Increased Output Current

You can double the maximum output current to 16A by running the two outputs in parallel as shown in Figure 3. Note that the FB pins share a single voltage-set feedback resistor that is half the value of the feedback resistor in

the usual two output configuration. This is because the internal $10k\Omega$ top feedback resistors are in parallel with one another, making the top value $5k\Omega$.

It is preferred to connect CLKOUT1 to CLKIN2 when operating from a single input voltage. This minimizes the input voltage ripple by running the two regulators out of phase with each other. If more than 16A output current is required, then multiple LTM4616 regulators can be configured for multiphase operation with up to 12 phases via the PHMODE pin. Figure 4 shows the expected efficiency of the parallel system at 5V and 3.3V inputs to 1.8V output. Note that the two regulators drive equal output current even during soft-start, as shown in Figure 5.

Conclusion

Whether you require a single 16A high current output or dual 8A outputs with sequencing, the LTM4616 provides a simple and efficient solution.

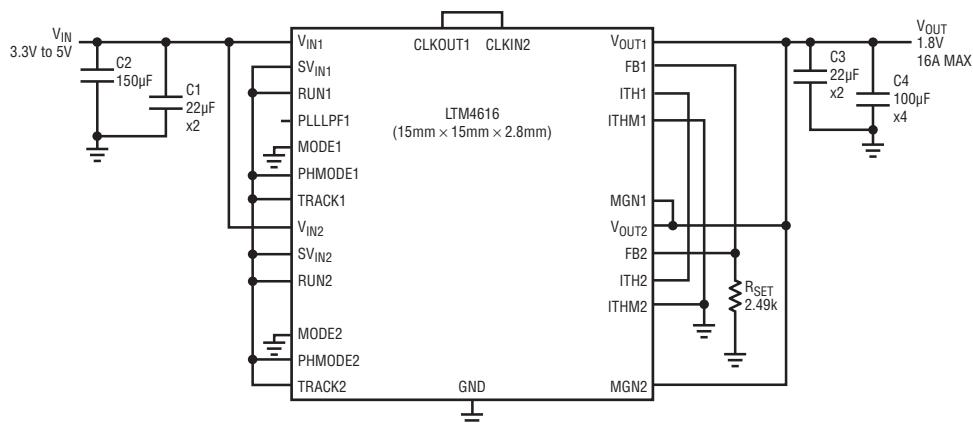


Figure 3. LTM4616 with 16A Parallel Operation

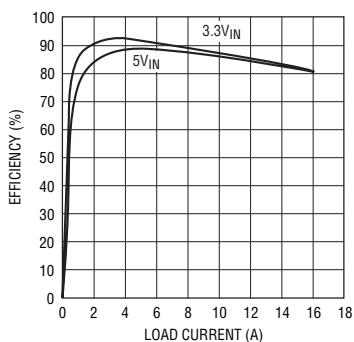


Figure 4. LTM4616 Efficiency: Single 1.8V Output

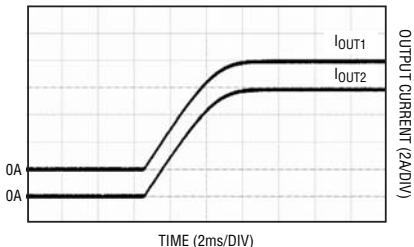


Figure 5. Balanced Current Sharing for Even Heat Dissipation [5V_{IN} to 1.8V_{OUT} at 16A]

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