

DESIGN NOTES

Dual 9A, Step-Down μ Module Regulator with Digital Power System Management

Design Note 542

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Introduction

The **LTM4675** is a dual 9A or single 18A step-down μ Module[®] (micromodule) DC/DC regulator featuring remote configurability and telemetry monitoring of power system management (PSM) parameters over PMBus—an open standard I²C-based digital interface protocol. Its 16mm \times 11.9mm \times 3.51mm BGA package includes analog control loops, precision mixed-signal circuitry, EEPROM, power MOSFETs, inductors and supporting components. It features a wide 4.5V to 17V input voltage range, and a 0.5V to 5.5V output voltage range with $\pm 0.5\%$ DC accuracy over temperature. LTM4675's power outputs can be digitally adjusted, margined and powered up/down at programmable slew rates and sequencing delay times. Maximum turn-on time is 70ms. Telemetry read back parameters include V_{IN} , I_{IN} , V_{OUT} , I_{OUT} ,

temperature, running peak values, uptime, faults and warnings. Current read back accuracy is $\pm 2.5\%$ at 9A load over temperature.

The LTM4675 facilitates the design of high efficiency, high power density and high reliability solutions for telecom, datacom and storage systems, plus industrial and instrumentation power supplies. The LTM4675 is offered in a 16mm \times 11.9mm \times 3.51mm BGA package available with SnPb or RoHS compliant terminal finish.

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Figure 1 shows a typical LTM4675 application. The input voltage range is 5.75V to 17V, and the outputs are 1V/9A and 1.8V/9A. Figure 2 shows the efficiency

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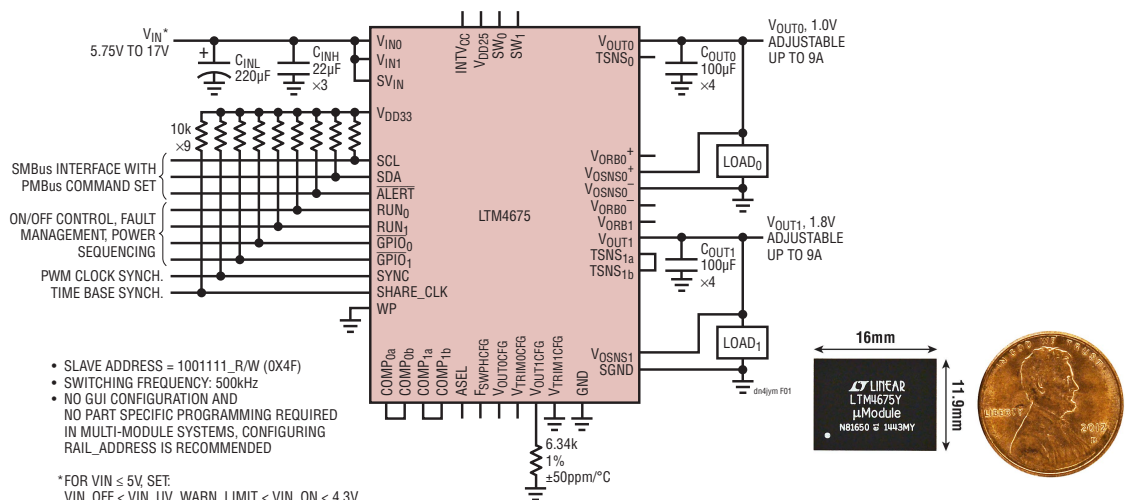


Figure 1. 9A, 1V and 9A, 1.8V Output DC/DC μ Module Regulator with Serial Interface

for each output of the LTM4675 for a variety of output voltages vs load current. The LTM4675 can achieve high efficiency over a wide operating range, with high reliability. Figure 3 shows that the maximum case temperature is 84.1°C when the module is running with a 12V input, 1V/9A and 1.8V/9A outputs, without airflow.

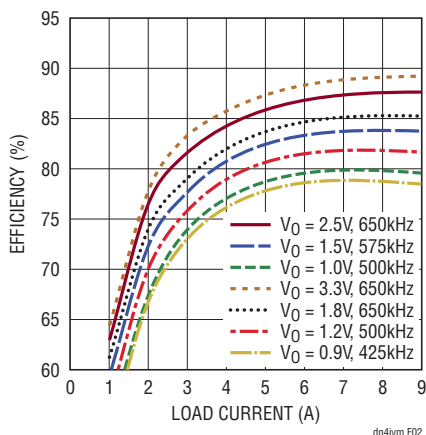


Figure 2. LTM4675 Single Channel Efficiency at $V_{IN} = 12V$

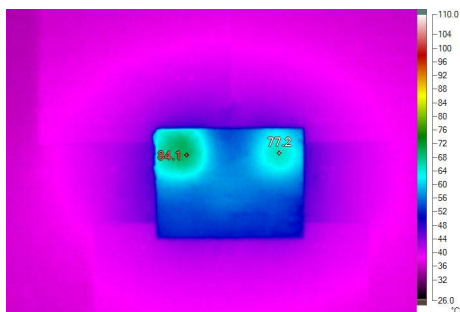


Figure 3. Thermal Performance of LTM4675 at $V_{IN} = 12V$, $V_{OUT0} = 1V/9A$, $V_{OUT1} = 1.8V/9A$, No Airflow, Tested on DC2053A. Maximum Temperature Rise = 61.1°C, $T_A = 23°C$

The LTM4675 offers internal compensation or external compensation, which can be used to optimize the transient response to load current steps over a wide operating range.

The LTM4675 supports a PMBus-compliant SMBus serial interface up to 400kHz. Readable data includes input and output voltages, currents, temperatures,

running peak values, uptime, faults, warnings and an onboard EEPROM fault log record. Writable data and configurable parameters include output voltage, voltage sequencing and margining, digital soft-start/stop ramp, OV/UV/OT, UVLO, frequency and phasing. The LTM4675 guarantees high accuracy telemetry read back with an integrated 16-bit $\Delta\Sigma$ ADC.

Multi-Module Operation for High Current Applications

The LTM4675 utilizes a constant frequency peak current mode control architecture, which enables cycle-by-cycle current limit and easy current sharing among phases when the channels are operated in parallel. For higher output current capability, it's easy to parallel multiple LTM4675 modules. Furthermore, the LTM4675 can be used as a master to drive non-PSM power modules to provide much higher output current. For example, the LTM4675 can drive three LTM4630s to provide up to 125A output current. Figure 4 shows the thermal picture of this application. With 400LFM of airflow, the hot spot temperature rise is only 66.2°C. The uniform thermal distribution among the modules is due to excellent current sharing performance.

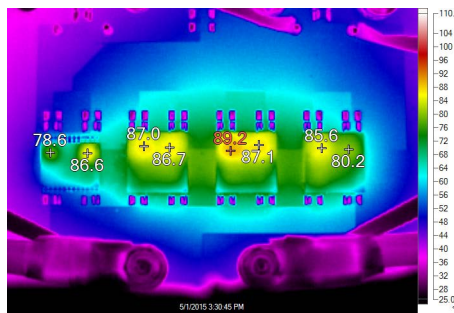


Figure 4. Thermal Picture at $V_{IN} = 12V$, $V_O = 1.0V/125A$, 400LFM Airflow, Maximum Temperature Rise = 66.2°C, $T_A = 23°C$

Conclusion

LTM4675 is a high efficiency and high power density μ Module regulator with built-in digital power system management. With all of the features mentioned above, the LTM4675 is ideal for telecom, datacom and storage systems, industrial and instrumentation applications.

Data Sheet Download

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