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PMIC Reduces Thermal Stress On Application Processors In Mobil Devices

To reduce thermal stress on application processors used in in smartphones and tablets, analog IC supplier ams AG has released a power solution that comprises a power management IC (PMIC), the AS3721, and an associated point-of-load (POL) power stage, the AS3729. Together, they provide a complete dc-dc solution that offers a fast response to load transients for reliable processor performance, high efficiency, and flexible board layout (see the figure.)

In essence, the AS3729 is a 5-A POL power stage that complements the integrated AS3721 PMIC. As shown in the figure, the power stage contains NMOS and PMOS FETs for each of two phases, which can be controlled separately and can handle an output current of 2.5 A per phase. In other words, the combination of the AS3721 with a single AS3729 results in a two-phase 5-A dc-dc converter. Consequently, when the AS3721 is combined with four AS3729s, the result is an eight-phase configuration that supplies 20-A maximum output current.

Product line manager Donald Travers says that the ams power solution gives designers the flexibility to select a single-phase or multi-phase configuration for optimizing design cost and board footprint, including product profile.

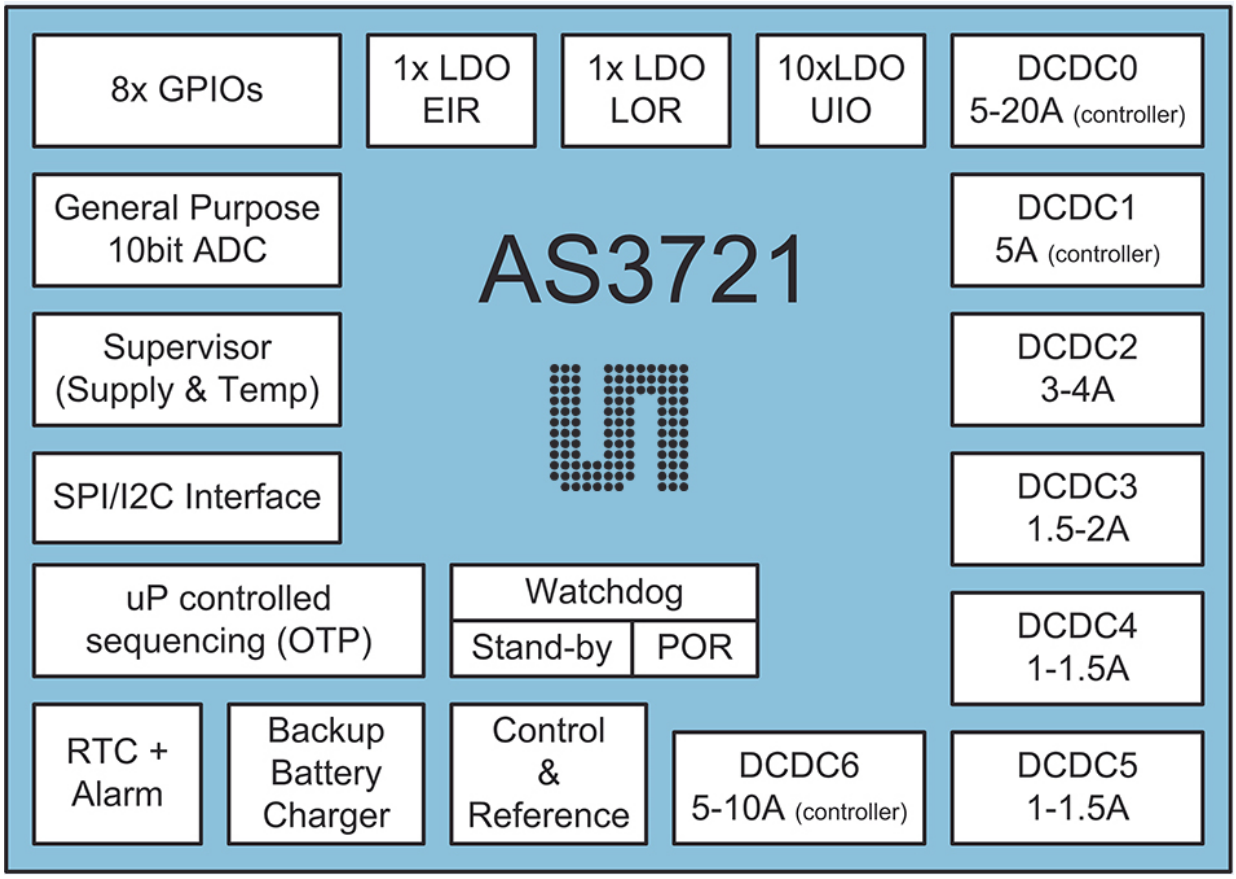
The AS3721 PMIC (Fig.2) features four step-down regulators supplying 4 A, 2 A and 1.5 A; three step-down controllers rated for 5 A, 10 A and 20 A; 12 digital LDOs; a real-time clock; a supervisor circuit; GPIOs; a general-purpose analog-to-digital converter (ADC); and a one-time programmable boot sequence. The input voltage range is 2.7 V to 5.5 V. While the AS3721 is housed in a 8-mm x 8-mm BGA with a pitch of 0.5 mm, the AS3729 power stage comes in a chip-scale package measuring 1.615 mm x 1.615 mm with 0.4-mm pitch.

According to Travers, the AS3721 and AS3729 combination is optimized for use with Nvidia's Tegra application processor. He also says that the PMIC enables a compact remote feedback path from the processor to the IC's integrated dc-dc controllers that requires only two wires (control and temperature signals) instead of the four or five wires typically required by conventional PMICs. The product manager attributed this feature to the company's patent-pending design innovation.

As a result, the two devices can be placed far apart in the board layouts of space-constrained devices such as smartphones, tablets and netbooks, says the manufacturer. This dramatically reduces the size and intensity of the hotspot around the processor as compared to conventional power architectures in which the processor and PMIC, both handling high currents simultaneously, must be located side-by-side, notes ams.

The feedback loop carried over the AS3721's two-wire interface also operates extremely fast, maintaining the processor it supports within its safe operating voltage even when supplying extremely fast-changing loads. Using an output capacitor of just 40 µF and at an output voltage of 1.0 V, the system's voltage drop during a step-up from 0.5 A to 5 A in burst mode is just 32 mV (typical.) Also, the rated peak efficiency at maximum load is 92%, which drops to below 88% at low load.

Both, the AS3721 PMIC and the AS3729 power stage are sampling now. In quantities of 1000, the AS3721 is priced at $2.65 and the AS3729 at $0.40.



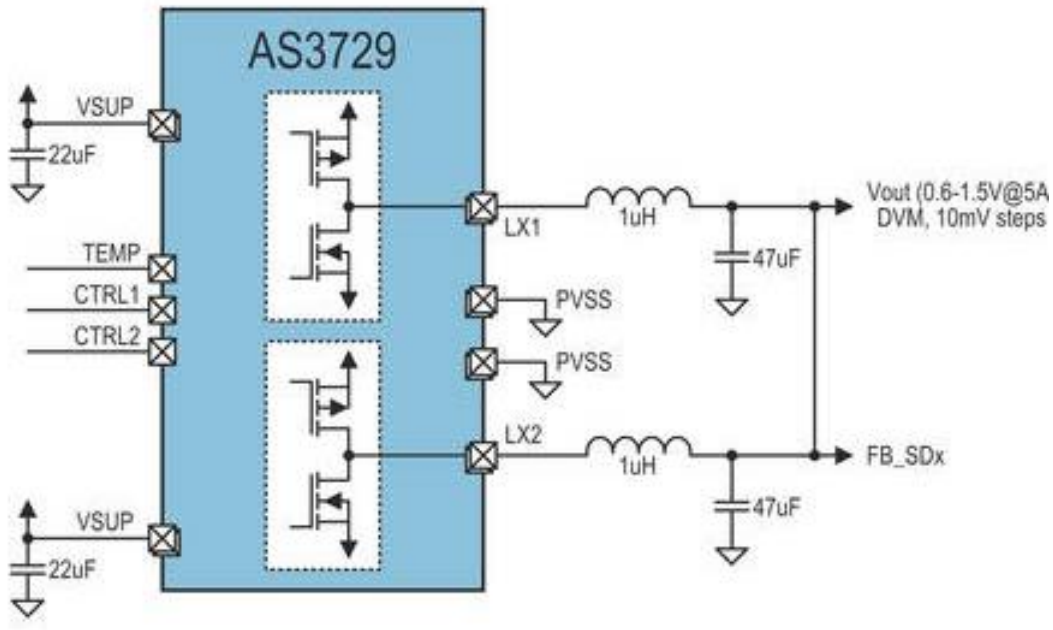


Figure. Optimized for use with Nvidia's Tegra application processor, the AS3721 power management IC (top diagram) and the AS3729 power stage (bottom diagram) form a complete dc-dc solution that offers a fast response to load transients for reliable processor performance, high efficiency, and flexible board layout. The AS3729 contains NMOS and PMOS FETs for each phase of a dual-phase dc-dc converter.

—Contributed by Ashok Bindra