ISSUE: June 2019

Programmable Multi-Channel LDO Packs High PSRR And Low Noise For Powering Smart Phone Cameras

Dialog Semiconductor's newest configurable mixed-signal integrated circuit (CMIC), the SLG51000, is said to offer industry-leading low dropout (LDO) regulator performance. Specifically, the IC features the highest power supply rejection ratio (PSRR) and the lowest output voltage noise of any programmable multi-channel LDO on the market, according to the vendor. These characteristics make the LDO well suited to powering advanced camera and sensor systems.

System power designers face stringent noise budgets when designing advanced sensor systems or high-end camera modules for consumers that demand the highest quality images from their smartphones, digital cameras or other smart imaging devices. According to Dialog, the SLG51000 exceeds the power performance requirements for such applications, compared to current market solutions which have significantly higher output voltage noise and relatively low PSRR especially at high frequency. In powering image sensors, the high PSRR is needed as the LDO is being used to clean up a supply rail generated upstream by a switching regulator.

"Today's launch of the SLG51000 highlights the success of our CMIC design capabilities following the acquisition of Silego Technology," said John McDonald, VP of marketing, CMBU, Dialog Semiconductor. "This CMIC's advanced features demonstrate Dialog's excellent power management design strengths coupled with Silego's proven CMIC platform, characterized by product flexibility, fast support and an awesome GreenPAK designer software platform."

The SLG51000's provides a PSRR of 73 dB at 1 MHz and an output voltage noise of just 10 µV rms. Each of the seven channels from the LDO regulator provide from 475 mA to 800 mA output current capability, and a low quiescent current of less than 1 µA for the entire IC during shutdown. This small, integrated power solution reduces board space, while configurable output voltage settings, sequencing and resources satisfy multiple project requirements to reduce redesign, sourcing and qualification time (Fig. 1).

According to Sidney Chan, senior product marketing manager at Dialog Semiconductor, competing LDOs integrated in power management ICs typically have around 40 dB PSRR at 1 MHz, so the SLG51000's PSRR represents a major improvement versus devices powering image sensors in camera modules (Fig. 2). Although there are standalone LDOs available with similarly high PSRR, these are typically more expensive. Similarly, according to Chan, the output voltage noise produced by the SLG51000 is significantly lower than that of PMIC-based LDOs, which typically specify 20 to 30 µV rms.

In general, performance improvements in one parameter come at the expense of another. But as Chan explains it, the design tradeoffs made in the SLG51000 were intelligent ones. Specifically, the IC consumes more power during operation, which is acceptable given that the image sensor is consuming hundreds of milliamps. However, when the part is in shutdown mode, quiescent current is specified at less than 1 µA, and has been measured at 400 nA. Since there are long stretches when the camera is not being used, this low I_Q is beneficial for battery life.

Working with the SLG51000, engineers can create a variety of functions and control logic for applications such as custom power sequencing, fault signaling, input conditioning and glue logic. All of this can be configured graphically thanks to the IC's unique GUI-based development software, adding to the ease-of-use advantage of the SLG51000 during development (Fig. 3).

"With camera performance becoming one of the key differentiators of high-end smartphones, device manufacturers need to deliver the absolute best image quality from their image sensors within increasingly compact devices and are facing tighter noise budgets as a result. The SLG51000 is cutting-edge when it comes to meeting those noise budgets, with the best LDO performance available for imaging and sensor applications on the market today," says McDonald.

The SLG51000 is sampling now and will be in production in the second half of 2019. For more information on the SLG51000, see the product page.

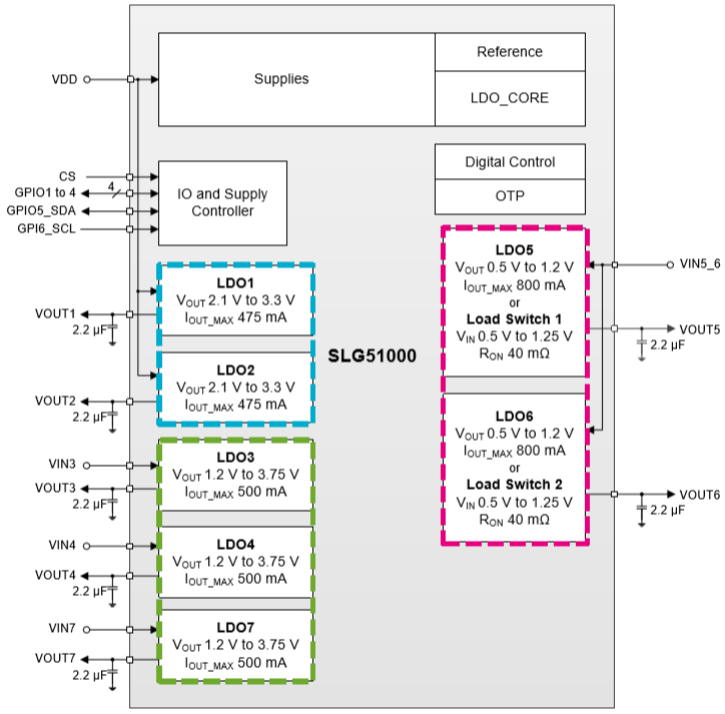


Fig. 1. Described as a CMIC (configurable mixed-signal integrated circuit) with high PSRR, low-noise multi-output LDOs, the SLG51000 contains seven compact and customizable LDOs and is designed for powering image sensors in high-performance camera modules, advanced sensor systems, and other small multi-rail applications.

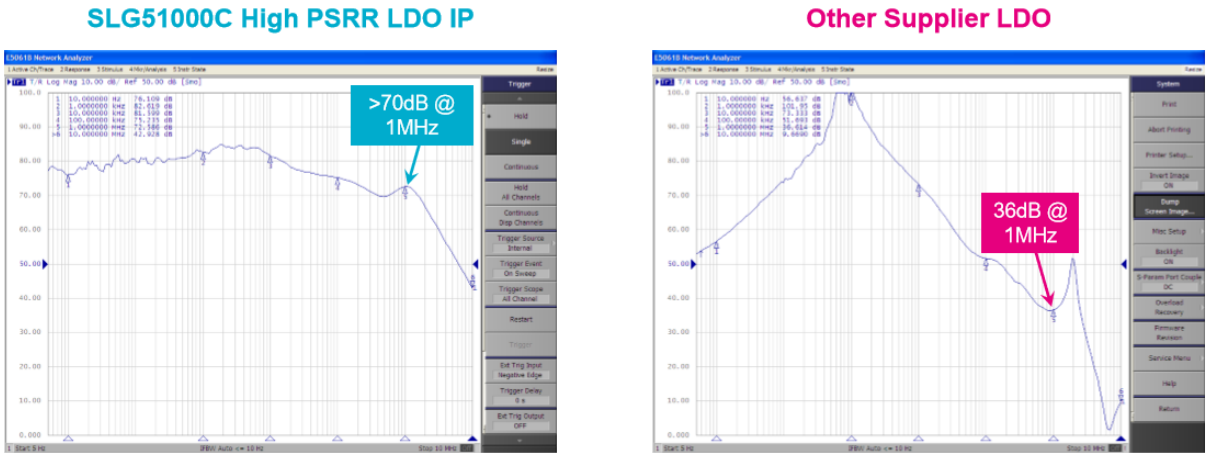
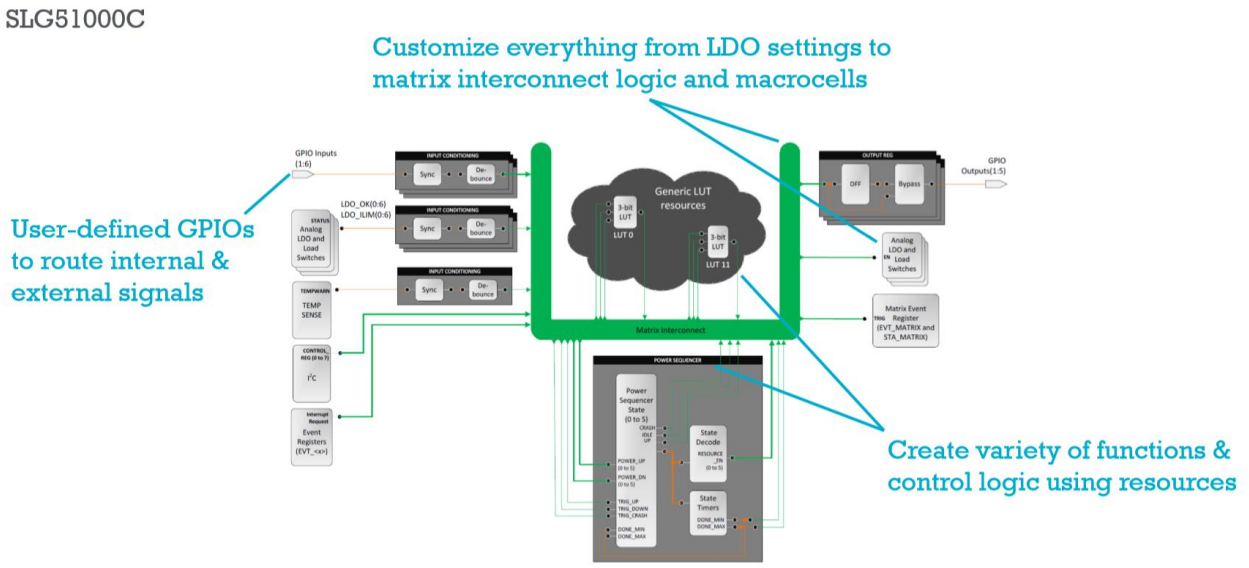
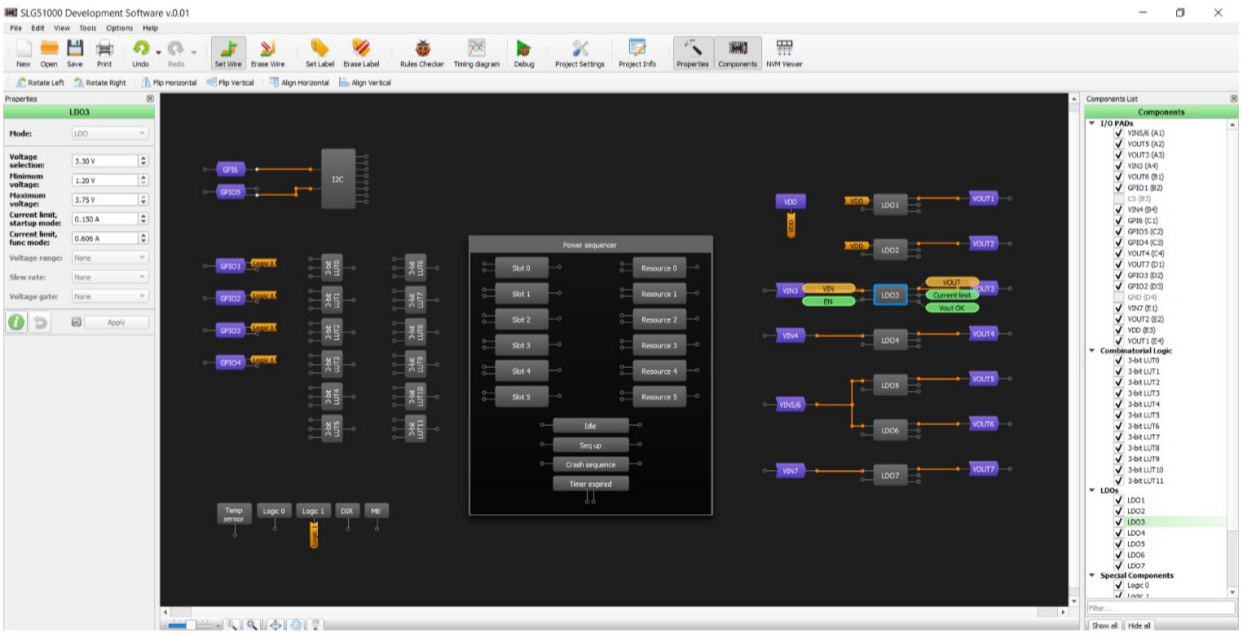


Fig. 2. The SLG51000's LDOs provide 73 dB of PSRR at 1 MHz and an output voltage noise of just 10 µV rms, enabling them to post regulate switcher-generated supply rails for image sensors and do so better than competing PMICs, according to the company.



(a)



(b)

Fig. 3. The CMIC is highly customizable. Users can configure and program the IC's various functions (a) using a GUI in the part's development software (b). The GUI will look familiar to designers who have previously worked with the company's GreenPAK devices.