

Supply Supervisor Delivers Glitch-Free Power-Up Down To 0.6 V And Lower

From [Maxim Integrated Products](#), the MAX16162 nanoPower supervisor is being introduced as the industry's first glitch-free supervisory IC. According to the company, this device is the industry's first to fully assert a system reset through the entire system power supply ramp, thereby eliminating low-voltage glitches during power-up and delivering higher system reliability (see Fig. 1). The MAX16162 is also differentiated by its low power consumption (825 nA quiescent current) and small size. With a package size of 1.06 mm by 0.73 mm (a 4-bump WLP), this supervisory IC is 23% smaller than the closest competitive solution, according to Maxim.

More IoT system designers are switching to microcontrollers with core voltages of 1 V and below, and, according to the vendor, existing supervisory ICs show unreliable outputs at these lower input voltages. Fig. 2 illustrates the glitch that can occur on the reset output of a typical supervisory IC during ramp-up of V_{CC} .

As Bob Gee, director of business management at Maxim, observes, this glitch was not a problem in the past with devices operating at higher core voltages. But with the move to sub-1-V supply voltages, the glitches became a problem since the glitch could be as high as 0.9 V. This leaves systems vulnerable to faulty power-up, causing the MCU to wake up in an undefined state with incorrect I/O outputs, wrong data reads or other errors.

The MAX16162, part of Maxim's Essential Analog family of robust supervisory protection ICs, eliminates glitches until the input voltage achieves the appropriate voltage threshold. The supply supervisor prevents system errors by asserting a consistent, glitch-free reset during power-up, even for inputs below 0.6 V. Eliminating glitches improves reliability not only for IoT systems, but also portable medical monitoring devices, wearables, base stations, programmable logic controllers and automation controls. Fig. 3 shows a measurement of the MAX16162's reset output during turn-on of an LDO.

According to Gee, architectural changes have been made in the design of the supervisor to remove the glitch. Although the company won't say how they achieve this result, they note that Maxim and other vendors already have other devices with deglitched outputs, so similar techniques may be in use here.

The table below compares the new device with existing supervisory ICs including an existing part from Maxim. While the MAX16162 has the advantage in glitch-free operation and in supporting lower supply voltages, as the table indicates, there's a slight penalty in power consumption as some addition power is used in removing the glitch.

Other features of the MAX16162 include separate V_{CC} and V_{IN} , multiple available reset timeout periods, thresholds from 0.6 V to 4.85 V, and the option of the previously mentioned 4-bump WLP or a 4-pin SOT-23. Operating temperature range is -40°C to 125°C.

The MAX16162 is available at Maxim Integrated's website for \$1.19 each in quantities of 1000 and is also available from authorized distributors. To order or learn more, see the MAX16162 [page](#). EE-Sim models are also available from the [website](#).

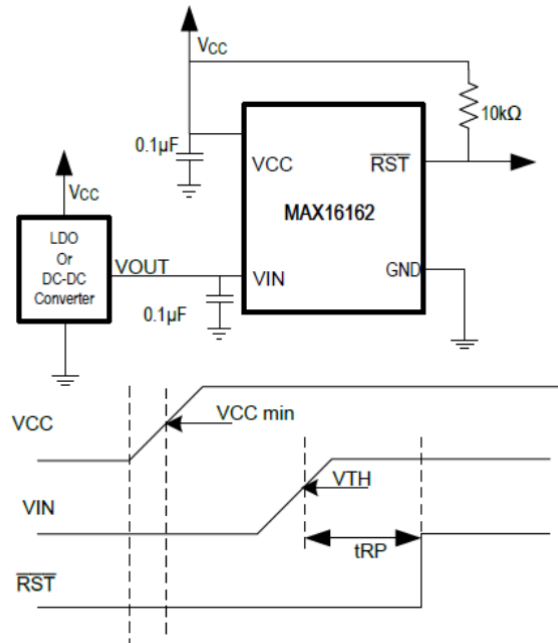


Fig. 1. The MAX16162 nanoPower supervisor's reset stays low during rampup of the supply voltage from the regulator so that there's no undefined region or glitch. The IC is available with thresholds from 0.6 V to 4.85 V and boasts a low quiescent current of 825 nA and the option of a 1.06-mm by 0.73-mm wafer-level package.

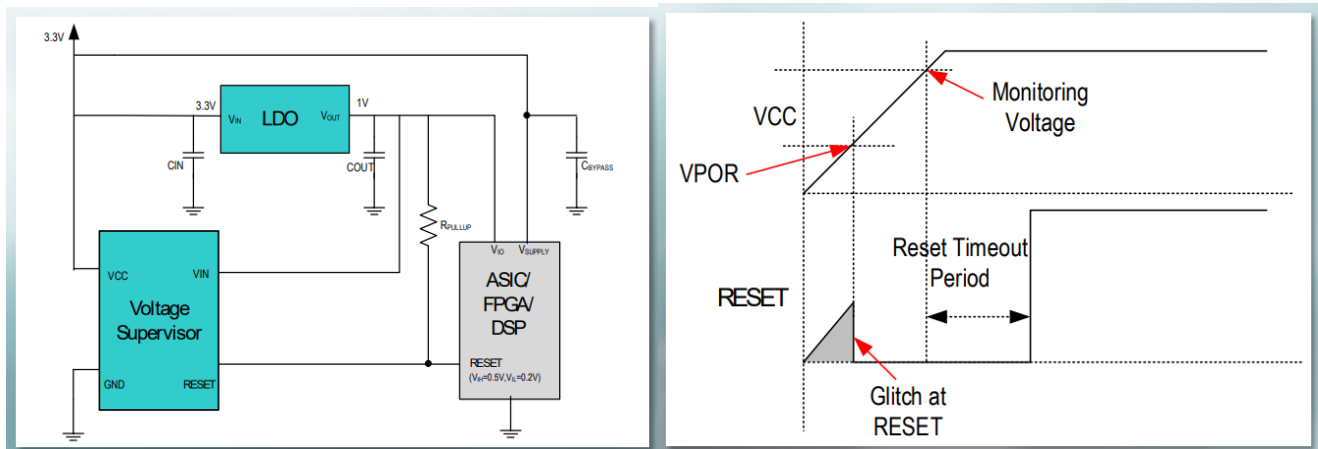


Fig. 2. As core voltages go lower, systems become more vulnerable to supply voltage glitches during power up, which can lead to problems such as an MCU waking up in an undefined state (causing various types of errors). With a typical interconnection of a supervisor IC between a voltage regulator and a low-voltage ASIC, FPGA or DSP, as shown on the left, the supervisor asserts the reset input when the regulator output is ready. However, usually a glitch can occur on the reset output during V_{CC} ramp-up, as shown on the right.

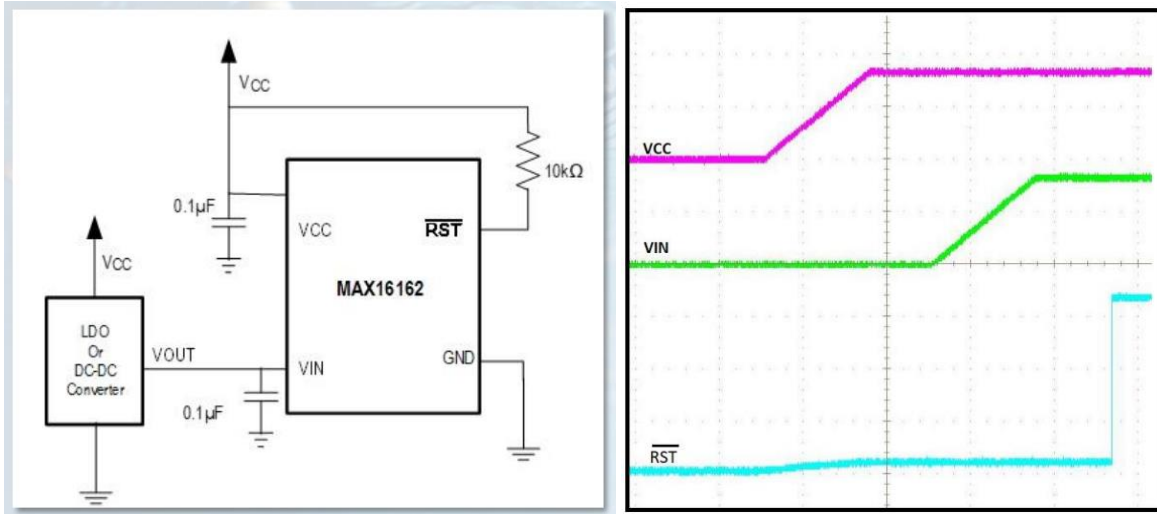


Fig. 3. The MAX16162's reset output is glitch free by design. This avoids the need for techniques that ignore the glitch in system. According to Maxim's Bob Gee, glitch free reset was requested by the company's customers.

Table. Comparison of the MAX16162 with existing voltage supervisors.

Key spec or feature	Benefit to customer	MAX16162	MAX16140	Competitors
Glitch-free power-up	Reliable startup	Yes	No	No
Low-voltage support	Great control at very low input voltages	0.6 V	1.7 V	0.9 V to 2 V
Low power consumption	Long battery life	825 nA	370 nA	92 to 500 nA
Smaller package	Small footprint	0.7-mm x 1-mm, 4 bump WLP	0.7-mm x 0.7-mm, 4 bump WLP	1 mm x 1 mm to 2 mm x 2 mm
Wide temperature range	Reliable in harsh conditions	-40°C to 125°C	-40°C to 125°C	-40°C to 85°C