

DESIGN NOTES

Versatile Voltage Monitors Simplify Detection of Overvoltage and Undervoltage Faults – Design Note 408

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Introduction

Many modern electronic systems have strict power supply operating ranges—requiring accurate monitoring of each supply. Some systems must know that all supplies are present and stable before startup and some must know if the supplies deviate from safe operating conditions.

The LTC[®]2912, LTC2913, and LTC2914 supervisors respectively monitor single, dual, and quad power supplies for undervoltage and overvoltage with tight 1.5% threshold accuracy over temperature. All monitors in the multiple-monitor devices share a common undervoltage output and a common overvoltage output with a timeout period that is adjustable or disabled. Each monitor has input glitch rejection to ensure reliable reset operation without false or noisy triggering.

Each part has at least two options: one with capability to latch the overvoltage output and one with capability

to externally disable both outputs. The LTC2912 has a third option with latching capability and a non-inverted overvoltage output. Each part has an internal 6.5V shunt regulator allowing the device to be used in a system with any supply level.

Basic Operation

Figure 1 shows a typical application for the LTC2914. Each monitored input is compared to a 0.5V threshold. Any channel can be configured to monitor both undervoltage and overvoltage conditions using a 3-resistor divider. When monitoring a positive voltage, the VH input of the channel is connected to the high-side tap of the resistive divider and triggers an undervoltage condition while the VL input is connected to the low-side tap of the resistive divider and triggers an overvoltage condition. When an

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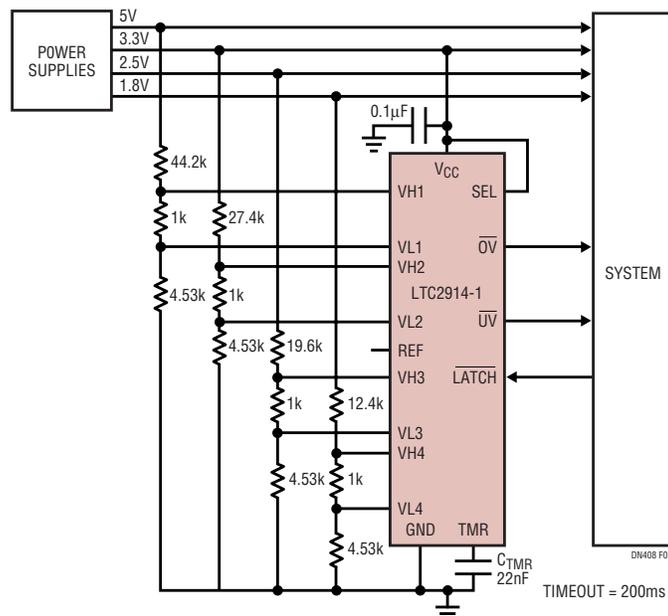


Figure 1. Quad UV/OV Supply Monitor

undervoltage condition is detected, the \overline{UV} output asserts low.

Once all undervoltage conditions clear, the \overline{UV} output remains asserted until a timeout period has elapsed. This timeout period is set by a capacitor between the TMR and GND pins. The timeout period can be disabled by tying the TMR pin to V_{CC} . Figure 2 shows the timeout period versus TMR capacitance. The \overline{OV} output behaves in a similar manner. On parts with latching capability, the \overline{OV} output latches when asserted until cleared by the LATCH pin. Holding the LATCH pin high bypasses the overvoltage latch.

Minimum Fault Length Monitor

The LTC2912-3 can be used to detect an undervoltage condition with a minimum duration by using the VL input

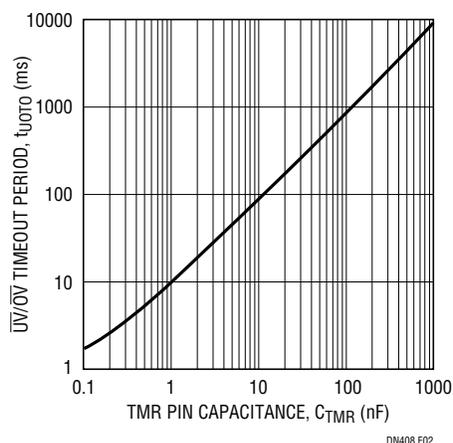


Figure 2. Timeout Period vs Capacitance

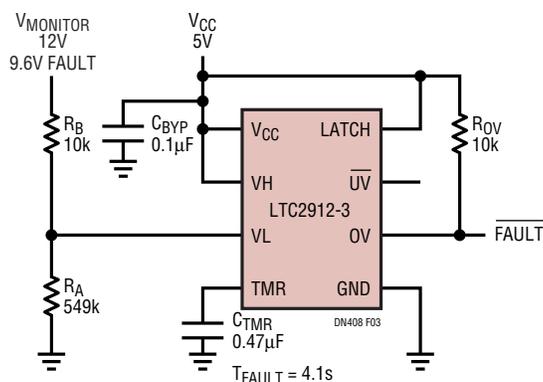


Figure 3. Fault Detection Circuit for a 4.1s Undervoltage Condition

and the non-inverted OV output. For example, an automobile system may need to monitor the 12V power supply during a power up condition. During the initial cranking of the automobile, the power supply droops. If the supply droop exists for an extended period, the system may need to disconnect various circuits from the supply for protection or disconnect circuits to reduce the load. This is accomplished by the circuit shown in Figure 3.

The timeout function of the LTC2912 typically starts when a fault clears. However, because the VL input is used in this case to monitor an undervoltage instead of an overvoltage, the timeout function occurs at the beginning of an undervoltage condition and the OV output remains high until the period has elapsed. If the fault still exists when this timeout period elapses, the OV output (FAULT) pulls low until the fault clears. Choosing a 0.47μF timing capacitor produces a 4.1s timeout delay. Therefore, any supply droop lower than 9.6V and longer than 4.1s asserts FAULT. Figure 4 shows the resulting waveform of a supply fault condition of 9V for 5 seconds.

Conclusion

The LTC2912, LTC2913, and LTC2914 simplify power supply monitoring of any voltage level by offering superior performance and flexibility. Only a few resistors are needed to configure monitoring of multiple voltages for both undervoltage and overvoltage conditions. The LTC2914 offers these features in a 16-lead SSOP and 16-lead (5mm × 3mm) DFN package, the LTC2913 in a 10-lead MSOP and 10-lead (3mm × 3mm) DFN package, and the LTC2912 in a tiny 8-lead ThinSOT™ and 8-lead (3mm × 2mm) DFN package.

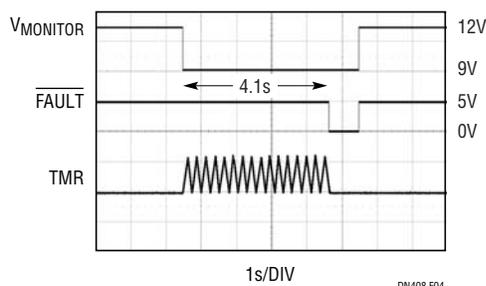


Figure 4. Fault Detection Waveform of a 4.1s Undervoltage Condition

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